NCR

NCR 5633 Currency Dispenser

Service Manual

Federal Communications Commission (FCC) Radio Frequency Interference Statement

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Canadian Class A Device Declaration

This digital apparatus does not exceed the Class A limits for radio noise emissions from digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications.

Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de la classe A prescrites dans le Réglement sur le brouillage radioélectrique édicté par le ministère des Communications du Canada.

Information to User

This equipment must be installed and used in strict accordance with the manufacturer's instructions. However, there is no guarantee that interference to radio communications will not occur in a particular commercial installation. If this equipment does cause interference, which can be determined by turning the equipment off and on, the user is encouraged to consult an NCR service representative immediately.

Caution   NCR Corporation is not responsible for any radio or television interference caused by unauthorised modifications of this equipment or the substitution or attachment of connecting cables and equipment other than those specified by NCR. Such unauthorized modifications, substitutions, or attachments may void the user's authority to operate the equipment. The correction of interference caused by such unauthorized modifications, substitutions, or attachments will be the responsibility of the user.

Revision Record

Date	Page	Description of Change
Jan 1999	All	Initial release

Contents

Chapter 2
Installation

Chapter 3
Operating Instructions

Chapter 4
Maintenance Instructions

Appendix A
Specifications

Appendix B
Replaceable Parts

User Feedback Form

Preface

Purpose

This manual contains the information required to maintain the 5633 Currency Dispenser. It includes a functional description of the dispenser, adjustment procedures, calibration procedures, internal cabling, parts identification, strapping details, power requirements, and mechanical installation in the host.

Audience

This manual is intended for design engineers who will be designing a host cabinet for the dispenser and for service engineers who will be maintaining the dispenser.

Organisation

The manual is organised into five chapters and three appendixes as follows:

Chapter 1 - **Functional Description**

Containers description, cassette identification, security levels, specification currency media, path of notes through dispenser, arrangement of sensors, power up/reset initialisation, and opacity detection.

Chapter 2 - **Installation**

How to mount the dispenser in a host, strapping details and calibration procedures

Chapter 3 - **Operating Instructions**

How to load cassettes into dispenser, and clearing jams

Chapter 4 - **Maintenance Instructions**

Calibrating procedures, adjustment procedures, interpreting level 0 diagnostics, preventative

maintenance procedures and module replacement procedures.

Appendix A - **Specifications**

Detailed specifications for the dispenser: environmental, physical dimensions, media, weight, power supply, interface and cabling (EMC)

Appendix B- **Replaceable Parts**

Provides a list of the recommended parts to replace on site.

Related Information Products

NCR 5031 Currency Dispenser Rework Support Tool User's Guide, B006-0000-6049 This guide provides information on the rework test tool that is required to calibrate the dispenser. It also contains details on spare parts.

Chapter 1

Dispenser Functional Description

Introduction

The 5633 dispenser presents a stream of bills in up to four denominations to the cardholder. A detect and purge system controls the movement of currency along the transport. Misfed or damaged currency is diverted into a purge bin.

The dispenser operates as an intelligent module under the control of its own on-board microprocessors. It communicates with the host ATM central processing unit over an RS-232-C bus.

The dispenser consists of the following modules:

- Pick and spray module

  This module picks an item from the currency cassette and transports it to the exit slot. It monitors the movement of the item through the transport. There is detection of multiple items and diverting of reject items to the purge bin.

- Control board
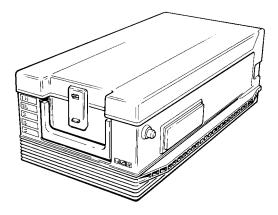
  This provides the control for the main functions of the dispenser and interface to the host ATM. The board controls sensors, solenoids and motors to control the sensing and presenting of notes which includes control for a divert mechanism, and transport drive. On power on, the board will execute level 0 diagnostics which report using LEDs.

- Media containers

  These are the currency cassettes and the purge bin.

Containers

Currency in the dispenser is contained in currency cassettes which are used to transport currency to and from the dispenser. The cassette security is provided by a seal on the lid latch. This requires a simple tool to be used to open the cassette.

Reject currency is diverted to the purge bin in the dispenser. The purge bin is provided with open security.
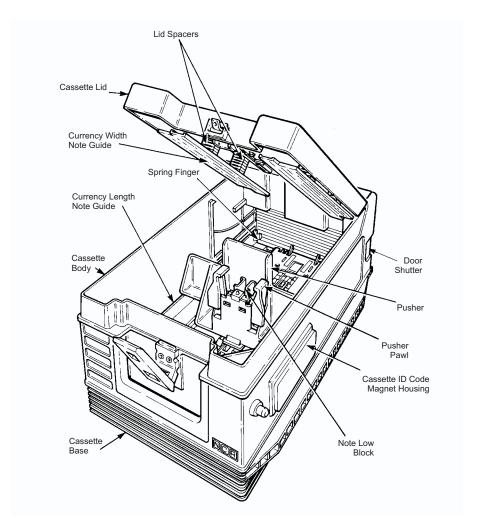
Both the currency cassettes and the purge bin remain seal fast secure when the ATM is opened.

The cassettes are moulded in high impact polycarbonate in three major parts: the lid, the body and the base.

Cassettes adjust to hold the range of sizes of bills dispensed by the currency dispenser:

Minimum		Maximum	
Width	Length	Width	Length
65mm	120mm	95mm	172mm
(2.56in)	(4.72in)	(3.74in)	(6.77in)

The illustration shows the open currency cassette looking from the rear (handle) end towards the front (truck door) end.

The Cassette Lid

The lid hooks into locating slots at the front of the body and is latched at the rear. It holds note guides and spacers which adjust to suit currency width.
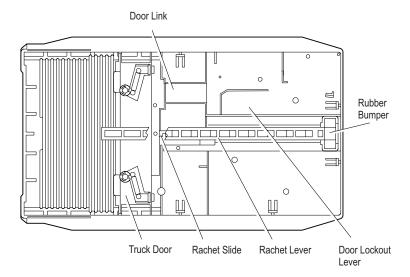
The Cassette Body

The cassette body holds the currency. It contains a spring-loaded pusher mechanism which moves along a slot in the bottom of the body, to push the currency stack to the front of the cassette into the pick position. The currency stack is held between the left- and right-hand note guides which adjust to suit currency of different lengths. The front ends of the note guides have spring fingers which help to separate the notes as they are picked from the stack. Incorporated in the pusher is the note low block magnet which operates a reed switch in the pick module. This magnet can be set to two settings. A housing on one side of the cassette body contains four magnets which again operate reed switches on the pick module to signal the cassette identification code.

Also in the body compartment are the left and right spring-loaded door shutters, the currency separator brushes and fingers. On the outside of the body are the lid latch and cassette carrying handle, the projecting lug which is used to latch the cassette into the pick module, and the embossed cassette identification code label.
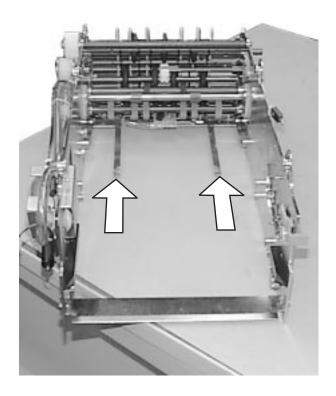
The Cassette Base

The illustration below shows the components inside the cassette base.

Door Link

Rubber
Bumper

Truck Door   Rachet Slide   Rachet Lever   Door Lockout
Lever

The base of the cassette holds the truck door and its retraction mechanism, the pusher ratchet slide and lever. The shape of the base forms rails which slide into the cassette guides in the pick module.

Cassette Operation

The above illustration shows the components of the dispenser pick module which mate with the cassette. When the cassette is inserted into the dispenser the prongs of the pick module keyplate enter the holes in the base of the cassette and push against locking pawls on the truck door. The door is pushed into the cassette base, leaving the front open to permit the currency to be picked from the cassette and dispensed.

Several other actions happen as the truck door is opened:

● The door shutters are disengaged from the door and are pushed back by the pick line

- The fingers next to the currency separator brushes drop down clear of the currency stack. The function of these fingers is to prevent notes at the front of the stack being dragged down by the opening door

- The ratchet slide attached to the door lowers the ratchet lever so that it disengages from the pusher pawl

As the currency is dispensed the pusher moves forward under spring pressure to keep the stack of currency in position. The pick line has an eccentric motion which tends to push the currency stack back into the cassette against the action of the pusher. It is to permit this to and fro motion that the ratchet lever disengages from the pusher when the cassette is in the dispenser. When the pusher moves close to the front of the cassette the magnet in its base comes alongside metal plates under the floor of the currency compartment. These plates strengthen the magnetic field and transfer it to operate a reed switch on the pick module keyplate. This switch signals that the currency in the cassette is running low.

Removal of the cassette from the dispenser automatically closes and latches the front door and the interior of the cassette can only be reached by opening the top access lid. The ratchet is raised by the action of the door closing and is again in a position where it will engage with the pusher pawl. In this way the pusher is locked close to the currency stack so that the currency is held in place while the cassette is being carried.

Pusher Operation

To load currency into the cassette the pusher is manually moved fully to the rear and locked until the currency is put in. It is then released against the back of the currency stack to keep it under pressure. You move the pusher by lifting the pusher pawl arms, sliding it to the rear, and then holding it in that position while lowering the arms

so that the pusher pawl engages with the ratchet. There is one locking detent on the extreme rear end of the ratchet.

Caution   Lift the pusher pawl arms - do not squeeze.

LIFT - DO NOT SQUEEZE

PUSHER
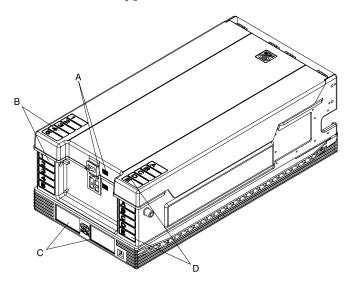
Cassette Identification Code

Each currency cassette shipped with a dispenser is set with a code that can be read by the dispenser software so that the cassette can be identified regardless of its position in the dispenser. The software matches the cassette code to a specific denomination of currency. Cassettes with the same code will be loaded with notes of the same value.
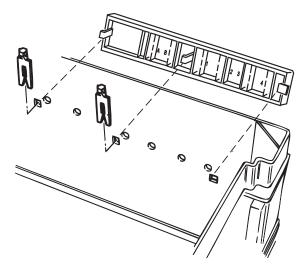
The cassette can be identified by writing the currency denomination on the inside or outside of both the body and lid, using an indelible ink pen.

● A: Colour coded stick-on labels 10 mm x 15 mm (0.4 in. x 0.6 in.) approximately

● B: Numerics for denoting cassette identification type

● C: Recessed areas for either marking with indelible ink pens or for attaching adhesive labels to denote currency denomination, etc. at the discretion of the financial institution

● D: Alphas for denoting additional cassette identification types or, for same use as B.

The cassettes provided with the four position dispenser are each set to a different code, that is Code 1, Code 2, Code 3 and Code 4. These can be changed so that, for example, the dispenser will dispense two different denomination notes from the four cassettes, that is with two cassettes set to Code 1 and two to Code 2.

The identification code of a cassette is set by up to four magnets contained in a plastic housing attached to the cassette side frame by a clip as shown in the following figure.The cassette has space in the plastic housing for six magnets (positions A, B, 1, 2, 3 and 4), but only four (positions 1, 2, 3 and 4) are currently used.

The magnets interact with four reed switches located on a printed circuit board attached to the frame of the dispenser pick module associated with the cassette location in the dispenser subsystem. The four reed switches have the following functions:

- Depending on whether a magnet is installed or not and the orientation of the magnet in positions 2, 3 and 4, three of the reed switches provide a code representing the cassette identification number.

- The magnet in position 1 interacts with the fourth reed switch to provide another code that indicates to the currency dispenser subsystem that the cassette is present.

Cassettes of any type can be placed in any pick module. The dispenser identifies each cassette by the interaction of magnets on its side with four reed switches on each pick module.

Cassette types are identified in the following way:

Front of Cassette	Reed Switches				Rear of Cassette
(door end)	S1	S2	S3	S4	(handle end)
	0	0	1	1	Cassette type 1
	0	1	1	0	Cassette type 2
	0	1	0	1	Cassette type 3
	0	0	0	0	Cassette type 4

Magnet present (switch contacts made) = 0
Magnet present (switch contacts open) = 1

More than one cassette of a particular type can be installed. The dispenser treats all cassettes with the same type as one logical cassette. Selection order is from the uppermost pick module downwards.
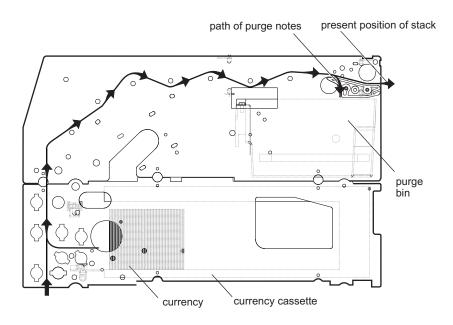
Mechanical Description

The dispenser consists of from one to four pick modules beneath a spray module. In the following description, the components are described in the order they are encountered by notes passing through the dispenser.
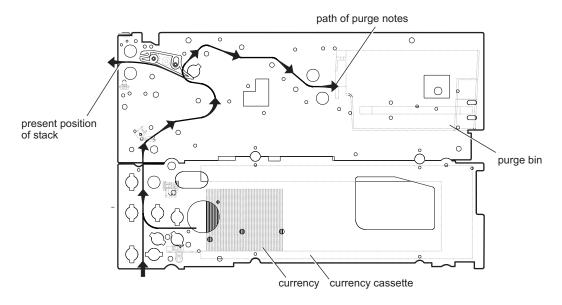
Path Of Notes

The path of notes through the dispenser is shown in the following diagrams.

Front access dispenser:

path of purge notes   present position of stack

purge bin

currency   currency cassette

Rear access dispenser

path of purge notes

present position
of stack

purge bin

currency   currency cassette
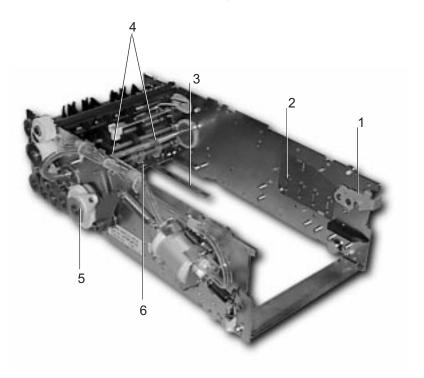
Pick Module

The pick modules of the dispenser fit vertically below the spray module to allow one, two, three or four pick positions.

Pick position number 1 is immediately below the spray module, number 2 is below number 1, number 3 below number 2, and 4 below 3.

There are two types of pick module; the single pick module holds one currency cassette, and the double pick module holds two cassettes, one above the other.

Functions of the Pick Module

Pick modules:

- provide support for currency cassettes
- identify the inserted cassettes
- open the front of the inserted cassettes
- lift (picks) bills one by one from the cassettes
- detect when currency is running low
- transport the bills to the pick module above or to the spray module.

The components of the pick modules which achieve the above functions are:

- cassette guides and latch mechanism
- cassette present and identity sensors
- pick module keyplate
- pick action components: pick arms, suction cups
- pick solenoids and timing disks
- pick sensors
- cassette low sensors
- gear driven transport.

The following description applies to a single pick module with the differences for the double pick described where necessary.

Currency Cassette Guides and Latch

The currency cassette rests on metal rails on the side frames of the pick module. Upper plastic guides on the side frames and the spring loaded catch hold the cassette firmly in position.

Cassette Present and Identity Sensors

A printed circuit board on the side of the pick module carries four (eight on the double pick) reed switches. These switches are in close proximity to the inserted currency cassette and they are influenced by the magnetic fields of small permanent magnets in a housing on the side of the cassette.

One of the magnets is always kept in the same position so that it operates the reed switch SW1 in the single pick module (SW1 for the upper cassette of the double pick module and SW5 for the lower cassette) to produce a "cassette present" signal. Switches SW2, SW3, and SW4

(SW6, SW7, SW8) are actuated when magnets are present in the corresponding three position in the cassette.

The magnets can be moved within the housing or left out so that certain combinations of reed switches SW2, SW3, SW4, are operated. This achieves a binary code which is used to identify the cassette as type 1, 2, 3 or 4. When the currency cassette is inserted into a pick module in any position in the dispenser, it signals its identity via the reed switches. The firmware identifies each cassette and so is able to select the proper one for dispensing bills of a specific denomination.

Pick Module Keyplate

When the cassette is inserted into the dispenser the prongs of the pick module keyplate enter the holes in its base. The cassette door is pushed into the cassette base, leaving the front open to permit the currency to be picked and dispensed.

Pick Action
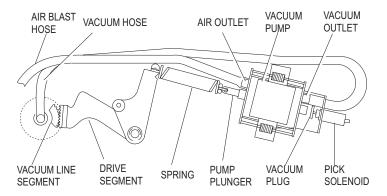
Each pick module carries one pick solenoid, a vacuum pump and a pick mechanism. The pick solenoid is energized to plug the air intake of the vacuum pump so that vacuum is applied to the suction cups. The pick solenoid stays energized when multiple bills are picked from the same cassette. In each pick cycle, one bill is picked and fed into the transport mechanism.

In the case of failure to pick a bill, the pick solenoid stays energized for an additional three or four cycles. After the first failure to pick, a search is made for another cassette of the same type which is not low on bills. The search order is from the top cassette position downwards. If the pick sensor has still not detected a bill, the motor is turned off for approximately one second then another

pick attempt is made. If this fails, the motor is turned off for 10 seconds and one more attempt is made to pick a bill. If no bill has been picked after three attempts of four or five pick cycles, a status code identifying the pick failure is sent to the host ATM.

Vacuum Pump   Each vacuum pump has two functions:

● To provide vacuum to the suction cups for picking a bill

● To provide an air blast to blow the dust off the pick sensor.
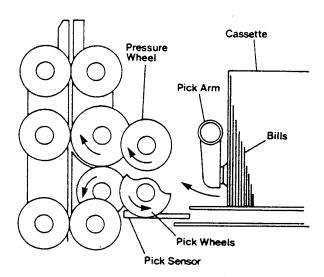
Vacuum is applied to the suction cups when the pick solenoid is energized and the air intake to the pump is plugged. During the forward stroke, the pump plunger is spring driven, which allows for reserve vacuum capacity in case of a minor leakage in the vacuum line. When the required vacuum capacity is reached, the spring flexes and the pump plunger does not move any further.

Also during the forward stroke, a small jet of air is blown on the pick sensor to avoid the accumulation of dust.

Pick Mechanism Operation   After receipt of a valid dispense command, the divert module transport motor energizes to drive all the dispenser transport sections and swing the pick arms back and forth.
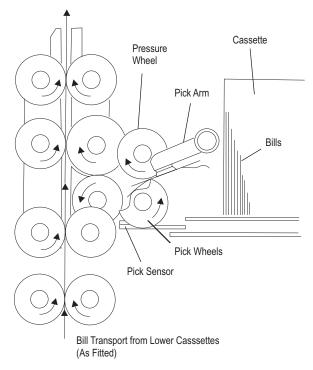
The following pick operation occurs at the selected pick module:

- As the pick arm suction cups are about to hit the cassette mounted bills, the pick solenoid energizes and the vacuum pump operates to apply vacuum to the suction cups.
- The pick arm suction cups then hit and hold the end bill within the cassette.

- As the pick arms start to swing up and away from the cassette, a bill is removed through the rear cassette separator from the cassette.
- The pick arms then swing up and away from the cassette to position the bill just above the pick wheels

● The picked bill is taken up between the pick and pressure wheels and fed into the transport section.

The above pick and feed operation repeats until the bill count of good bills at the pick sensor equals the number given by the dispense command.
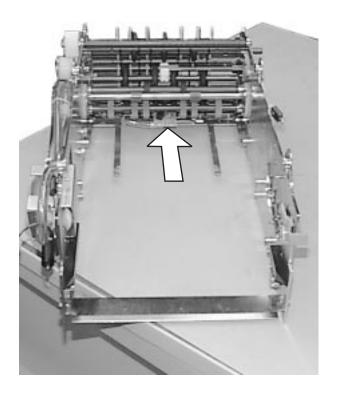
Double Detect Sensor

Each pick module carries one sensor, which is mounted between the module pick mechanism and transport section. The light source is a filament bulb and the detector is a photodiode.

This sensor detects bill opacity and width and enables the on board firmware to determine whether a picked bill is good or bad (undersize, oversize or a double).

Detection of two bills having been picked together depends on the reduced amount of light transmitted through the bills as compared to the inherent translucency of a single bill. The degree of translucency, or the amount of light that passes through a single bill, is predetermined and a hexadecimal coded value for each cassette type.

When a bill passes between the lamp and the photo diode, the intensity of the light detected by the sensor is amplified and converted into a digital voltage reading. The processor then compares this reading with the hexadecimal value and determines whether the pick operation was successful or not. If not, the divert solenoid diverts the bill into the reject bin.

Cassette Low Sensor

The cassette low sensor consists of a reed switch attached to the pick module keyplate. The reed switch is held on a bracket which projects into the open door of the cassette. It operates when a permanent magnet attached to the cassette currency pusher mechanism approaches the front of the cassette as the currency is dispensed. In the plastic cassette, the position of this magnet can be set in two positions to actuate the switch when 75 ± 50 or 200 ± 50 notes are left in the cassette.

Spray Module

The spray module is mounted directly above the pick module. The module houses the reject bin and carries the following major assemblies:
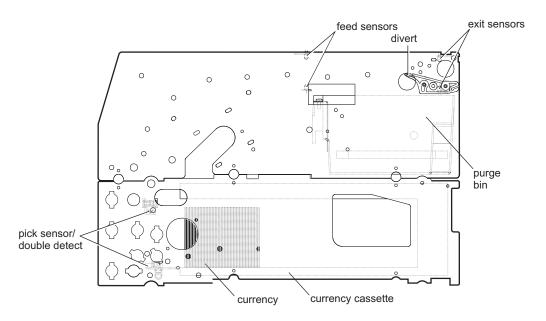
- Reject bin present switch
- Transport motor and transport section
- Count sensor
- Divert gate solenoid, a two position divert gate and divert gate position sensors

The spray module caters for the longest width notes and utilizes an induction motor. A constant transport drive speed is obtained by using different sized drive pulleys.
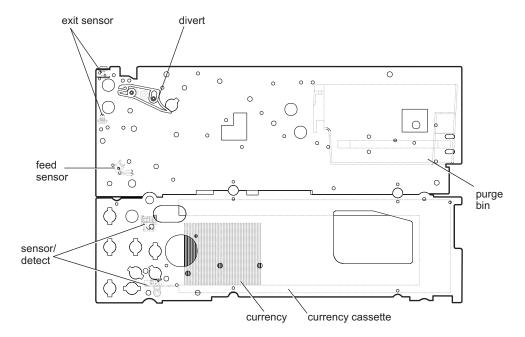
Transport Belts and Sensors

The following diagrams show the belt and transport sensor arrangements for spray module. The numbers allocated to the sensors appear in the control board signal names

Front access dispenser.

feed sensors
divert
exit sensors
purge bin
pick sensor/ double detect
currency
currency cassette

Rear access dispenser

exit sensor   divert

feed
sensor

purge
bin

sensor/
detect

currency   currency cassette

Transport Sensors

On the way along the transport, the progress of the stack of bills is monitored by infra-red sensors, and their related LEDs. In the dispenser the number of sensors is the same for front and rear access versions.

Main Timing Disk

The main timing disk pulley is driven by toothed belt from the main motor. Thirty-six holes around the periphery of the timing disk create the timing pulses from an opto-electronic sensor. The output of the sensor is used to measure the movement of the bills as far as the exit sensor and as a reference in the measurement of bill

width. The interval between the interrupts represents a distance travelled by the bill of approximately 2 mm.

Feed Sensor

The feed sensor detects bills as they are fed from the transport section and presented to the divert gate. The firmware initiates a divert gate operation timing sequence every time a good bill reaches this sensor.

Exit Sensor

The last sensor on the transport is the exit sensor which verifies that bills have passed the divert gate and are on their way to the customer access tray.

Purge Bin Location Components

The purge bin is held in the spray module so that it is accessible from the same position as the currency cassettes. It is supported by guide rails and is locked in position by a latch. A microswitch attached to the side frame on the spray module is operated by the inserted purge bin to inform the electronics system that the bin is in place.

Divert Gate

The divert gate position sensors are mounted so as to detect movement of the divert gate.

Main Motor

The main motor provides mechanical drive to the spray module and all pick modules via toothed timing belts. It also drives the vacuum pump on each pick module.

Motor Control Circuit

The motor control circuits are located on the dispenser control board, attached to the side of the dispenser.

Control Board

The Electronics are designed around the 80C562 Microprocessor which is a derivative of 80C51 architecture and technology.

The Control Board Electronics has to perform a number of distinct functions:

- AC Motor Transport
- Pick Control
- Cassette Identification
- Divert Gate
- Sensors
- Comms

General Description

This is based around the Philips 80C562 microcontroller, full details of which can be found in the Philips Data Sheet for 80C562 Micro-processor. There is addressing available for up to 64K of code memory (EPROM) and 64K of Data memory (SRAM). This design uses 64K EPROM and 32K of SRAM residing in the lower half of the data area. The board will also accept 32K EPROM's requiring a resistor jumper to be moved. The EPROM contains Level 0 diagnostics and executable code. The SRAM contains variables, buffers and other data. SRAM is battery backed.

A Level 0 diagnostic interface is implemented using 2 LED indicators on ports P4.0-P4.1 on the 80C562.

The selection of memory mapped peripherals and ports is accomplished by a 3 to 8 way decoder. The mapped devices consist of buffers used to interface to various

Sensors, Comms Control hardware, diagnostic switches and user switches.

Hardware Overview

The 80C562 processor operates at a clock frequency of 14.7456 MHz.

The processor has its integrated IO ports assigned as follows:

Port	Assignment
P0.0 - P0.7	Multiplexed Low Address/Data Bus: D0-7
P2.0 - P2.7	High Address Bus: A8-15
P1.0	Exit Sensor Input: uPEXIT_SENS
P1.1	Feed Sensor Input: uPFEED
P1.2	Divert Position Sensor Input: uPDIV_POS
P1.3	Pick 3Solenoid Output: uPPICK_SOL3
P1.4	Timing Disk Sensor Input: uPTIM_DISK
P1.5	Connected to P1.6 (pulled high)
P1.6	Connected to P1.5 (pulled high)
P1.7	Pick 4Solenoid Output: uPPICK_SOL4
P3.0	Serial Comms Receive: uPRXD
P3.1	Serial Comms Transmit: uPTXD
P3.2	N/C
P3.3	Timing Disk Sensor Input: uPTIM_DISK
P3.4	Serial Comms Clear to Send: uPCTS
P3.5	Serial Comms Ready to Send: uPRTS
P3.6	Data memory Write Strobe: WRb

Port	Assignment
P3.7	Data memory Read Strobe: RDb
P4.0	LED Indicator 1
P4.1	LED Indicator 2
P4.2	Divert Solenoid Output: uPDIV_SOL
P4.3	Pick 1 Solenoid Output: uPPICK_SOL1
P4.4	Pick 2 Solenoid Output: uPPICK_SOL2
P4.5	AC Motor Output: uPDC_MOTOR
P4.6	AC Motor Pulse: uMOT_PULSE
P4.7	N/C
P5.0	Pick Module 1 Sensor Input: uPPICK_SENS1
P5.1	Feed Sensor Input: uPFEED
P5.2	Exit Sensor Input: uPEXIT_SENS
P5.3	Divert Gate Sensor Input: uPDIV_POS
P5.4	Pick Module 2 Sensor Input: uPPICK_SENS2
P5.5	Reject Bin Present Sensor Input: uPREJ_BIN_PRES
P5.6	Pick Module 3 Sensor Input: uPPICK_SENS3
P5.7	Pick Module 4Sensor Input: uPPICK_SENS4

Ports P1, P3, and P4 are assigned as individual bits.
Outputs to these ports should therefore be performed as
bit operations to avoid accidental corruption of other
bits.

Reset puts all IO ports to input condition except P5 which is input only. They are pulled high by internal pull-ups.

Memory Map

The memory mapping is performed by a 3 to 8 way decoder, for write and read signals.

The Memory Map is as follows:

	Code Area	Data Area	
FFFF		Comms Config Inputs	FFFF F000
		Cassette ID 1/2 Inputs	E000
		Link 5 Switches	D000
	32K / 64K Code Area	Opacity Two Switches	C000
		Opacity One Switches	B000
		Opacity Four Switches	A000
		Opacity Three Switches	9000
		Cassette ID 3/4 Inputs	8000
0000		32K Ram Area	0000

I/O Map

The memory mapped IO region of the map is allocated as follows:

Region	Allocation
F000H	Read Only - Comms ID/Cassette Sensor detect
	BIT 0 : 0 - Comms S0 : 1 -
	BIT 1 : 0 - Comms S1 : 1 -
	BIT 2 : 0 - Comms ID0 : 1 -
	BIT 3 : 0 - Comms ID1 : 1 -
	BIT 4 : 0 - Cassette One Low : 1 - Cassette One NOT Low
	BIT 5 : 0 - Cassette Two Low : 1 - Cassette Two NOT Low
	BIT 6 : 0 - Cassette Three Low : 1 - Cassette Three NOT Low
	BIT 7 : 0 - Cassette Four Low : 1 - Cassette Four NOT Low
E000H	Read Only - Cassette ID 1/2 Sensor detect
	BIT 0 : 0 - Cassette One ID 1 Present : 1 - Cassette One ID 1 Not Present
	BIT 1 : 0 - Cassette One ID 2 Present : 1 - Cassette One ID 2 Not Present
	BIT 2 : 0 - Cassette One ID 3 Present : 1 - Cassette One ID 3 Not Present

Region	Allocation	
	BIT 3	: 0 - Cassette One ID 4 Present : 1 - Cassette One ID 4 Not Present
	BIT 4	: 0 - Cassette Two ID 1 Present : 1 - Cassette Two ID 1 Not Present
	BIT 5	: 0 - Cassette Two ID 2 Present : 1 - Cassette Two ID 2 Not Present
	BIT 6	: 0 - Cassette Two ID 3 Present : 1 - Cassette Two ID 3 Not Present
	BIT 7	: 0 - Cassette Two ID 4 Present : 1 - Cassette Two ID 4 Not Present
D000H	Read function - Link 5 Configuration Switches, (U15) Bits 0-7.	
C000H	Read function- Opacity Configuration Switches Bank 2, (U25) Bits 0-7.	
B000H	Read function - Opacity Configuration Switches Bank 1, (U34) Bits 0-7.	
A000H	Read function- Opacity Configuration Switches Bank 4, (U7) Bits 0-7.	
9000H	Read function - Opacity Configuration Switches Bank 3, (U15) Bits 0-7.	
E000H	Read Only - Cassette ID 3/4 Sensor detect	
	BIT 0	: 0 - Cassette Three ID 1 Present : 1 - Cassette Three ID 1 Not Present
	BIT 1	: 0 - Cassette Three ID 2 Present : 1 - Cassette Three ID 2 Not Present
	BIT 2	: 0 - Cassette Three ID 3 Present : 1 - Cassette Three ID 3 Not Present

Region	Allocation	
BIT 3	: 0 - Cassette Three ID 4 Present : 1 - Cassette Three ID 4 Not Present	
BIT 4	: 0 - Cassette Four ID 1 Present : 1 - Cassette Four ID 1 Not Present	
BIT 5	: 0 - Cassette Four ID 2 Present : 1 - Cassette Four ID 2 Not Present	
BIT 6	: 0 - Cassette Four ID 3 Present : 1 - Cassette Four ID 3 Not Present	
BIT 7	: 0 - Cassette Four ID 4 Present : 1 - Cassette Four ID 4 Not Present	

Communication Ports

The control board handles communication using the RS-232 protocol.

The communication protocol is selected by jumpers in the communications connector.

RS 232 Communication Port

The signals for this communication port are implemented using buffers.

The strappings for the RS 232 port are tabulated below:

Mode	From	To
Non Polled	No Links	
Polled	Pin 10 (Gnd)	Pin 22 (COMM _S0)
	Pin 4 (RTS)	Pin 5 (CTS)

Actuator Outputs

The transport mechanism is operated by an AC motor. Control of this motor is handled by the 80C562 and a

7407 buffer. The function of this signal is as follows: a logic 0 on this port will cause the AC Motor to switch on.

The uMOT_PULSE signal must be pulsed to keep the motor running. It retriggers a monostable circuit which would disable the motor after a short delay. This is used as part of the anti-runaway protection.

The Pick lamps are controlled by the PWM function in the microprocessor (refer to Philips Data Sheet for 80C562 Micro-processor for further details).

The divert solenoids are operated by a circuit which feeds full power to energise the solenoid and then feeds pulses of power to retain the solenoid.

The pick solenoids are hard-fired.

Sensor Inputs

There are three distinct Sensor inputs on the Control board, Pick sensor (double detect) inputs, Transport sensor Inputs and Cassette inputs.

Double Detect Sensors

These consist of 2 lines that come from the pick sensors through analogue buffers and are fed to the microcontroller's A/D inputs. These are as follows:

Pick Sensor 1	P5.0
Pick sensor 2	P5.4
Pick Sensor 3	P5.6
Pick Sensor 4	P5.7

Transport sensors

These consist of 5 lines that come from the transport sensors through buffers and are fed to the

microcontroller's Port 1 and A/D inputs. These are as follows:

Feed sensor	P5.1 and P1.1
Exit sensor	P5.2 and P1.0
Divert position sensor	P5.3 and P1.2
Reject bin present sensor	P5.5
Timing Disk sensor	P1.4 ALSO INT1 INPUT

Cassette sensors

These consist of 20 lines that come from the Cassette ID and Cassette low PCBs and are mapped as follows

F000H	Read Only- Comms ID/Cassette Sensor detect (0 = Low, 1 = Not Low)	
	BIT 4	Cassette One Low sensor
	BIT 5	Cassette Two Low sensor
	Bit 6	Cassette Three Low sensor
	Bit 7	Cassette Four Low sensor
E000H	Read Only - Cassette ID 1/2 Sensor detect (0 = Present, 1 = Absent)	
	BIT 0	Cassette One ID 1
	BIT 1	Cassette One ID 2
	BIT 2	Cassette One ID 3
	BIT 3	Cassette One ID 4
	BIT 4	Cassette Two ID 1
	BIT 5	Cassette Two ID 2

	BIT 6	Cassette Two ID 3
	BIT 7	Cassette Two ID 4
8000H	Read Only - Cassette ID 3/4 Sensor detect (0 = Present, 1 = Absent)	
	BIT 0	Cassette Three ID 1
	BIT 1	Cassette Three ID 2
	BIT 2	Cassette Three ID 3
	BIT 3	Cassette Three ID 4
	BIT 4	Cassette Four ID 1
	BIT 5	Cassette Four ID 2
	BIT 6	Cassette Four ID 3
	BIT 7	Cassette Four ID 4

User Configuration Switches

The main processor has 5 banks of 8 switches for setting a user configuration. These switches are defined as follows.

Opacity

Opacity Configuration Switches Bank 1
(U34) SW 1-SW8, Bits 0-7. B000H

Opacity Configuration Switches Bank 2
(U25) SW 1-SW8, Bits 0-7. C000H

Opacity Configuration Switches Bank 3
(U15) SW 1-SW8, Bits 0-7. C000H

Opacity Configuration Switches Bank 4
(U7) SW 1-SW8, Bits 0-7. C000H

The default opacities are read from the four opacity switch packs on the control board. The value is read as a hex byte with switch 1 (the switch closest to the edge of the control board) providing the least significant bit and switch 8 (the switch furthest from the edge of the control board) providing the most significant bit.

An opacity setting of 0 on the switchpack, that is all switches up, will cause all bills to be accepted as single bills. An opacity value greater than 80H, that is switch 8 down, will cause all bills to be rejected as doubles.

Note: If the opacity settings on the switchpack for cassette type 1 is set to FFH, that is all the switches down, then the NVRAM on the control board will be re-initialised. The settings should then be set to the correct value before using the dispenser to dispense bills.

Configuration

Link 5 Configuration Switches
(U15) SW 1-SW8, Bits 0-7. D000H

Switch	Meaning if set to 1
1	Baud rate (see below)
2	Baud rate (see below)
3	Not used
4	Not used
5	Not used
6	Not used
7	Not used
8	Enable encryption

Switch 2	Switch 1	Baud Rate
0	0	1200
0	1	2400
1	0	9600
1	1	4800

where 0 = up and 1 = down.

Reset Conditions

The Control board can be reset in a number of ways.

● Power On- Reset

This happens on the Control board when the power is applied. A resistor-capacitor network holds the processor in reset until approximately 400mS after applying power which is long enough for Vcc to stabilise.

● Test Reset

This is a reset generated on the RDI test connector. (J12)

● Terminal Reset

This is a reset generated by the host using the XRES line on the D-Type connector. This Reset will cause the 80C562 processor and all resettable devices on the board to be reset.

Diagnostic LEDs

The Control board provides 2 LEDs for State of health/Diagnostic use. Diagnostics writes to the LEDs on power-up to provide status information on the Control Board. The LEDs are accessed by writing to individual bits of Port 4 on the processor.

- LED1: P4.0 (D4)
- LED2: P4.1 (D3)

For these LEDs, '0' switches a LED off and '1' switches a LED on. Also, the state of the Level 0 LEDs is indeterminate on power-up.

Connector Interfaces

Communications Interface

Serial Input Connector, (J8), for interfacing the control board to the Terminal. This is a 25 way D type male connector.

XRES	13	25	COMM_ID1
COMM_ID0	12	24	GND
E1	11	23	COMM_S1
GND	10	22	COMM_S0
E0	9	21	DB
N/C	8	20	+5V
GND	7	19	DA
N/C	6	18	OOO
CTS	5	17	LRTS
RTS	4	16	LCTS
RXD	3	15	LTXD
TXD	2	14	LRXD
N/C	1		

Power

The Control Board receives power via a power connector, (J6)

GND	1
+5V	2
GND	3

+5V	4
KEY	5
GND	6
+24V	7

Dispenser Interface

The Cassette 1 ID board connects through connector, (J10)

CASS_ID1.1	1
CASS_ID1.2	2
CASS_ID1.3	3
CASS_ID1.4	4
GND	5

The Cassette 2 ID board connects through connector, (J9)

CASS_ID2.1	1
CASS_ID2.2	2
CASS_ID2.3	3
CASS_ID2.4	4
GND	5

The divert solenoid connects through connector, (J1)

+24V	1
DIV_DRV	2

The pick solenoids connect through connector, (J11)

PICK_1_DRV	3	1	+24V
PICK_2_DRV	4	2	+24V

The Transport Sensors connect through connector, (J2)

EXIT_SENS	1	2	GND
EXIT_LED	3	4	GND
DIV_GATE	5	6	GND
DIV_LED	7	8	GND
FEED	9	10	GND
FEED_LED	11	12	GND
TIM_DISK-	13	14	GND
TIM_DISK_LED	15	16	GND
REJ_BIN_PRES	17	18	GND
N/C	19	20	N/C
N/C	21	22	N/C
MOTOR_ON	23	24	+5V

The pick 1 sensors connect through connector, (J3)

LMP1_DRV	1	2	N/C
GND	3	4	PICK_SENS1.2
N/C	5	6	PICK_SENS1.1
CASS_LOW1	7	8	GND
GND	9	10	N/C

The pick 2 sensors connect through connector, (J4)

LMP2_DRV	1	2	N/C
GND	3	4	PICK_SENS2.2
N/C	5	6	PICK_SENS2.1
CASS_LOW2	7	8	GND
GND	9	10	N/C

The pick 3/4 sensors connect through connector, (J4)

CASS_ID3.1	1	2	GND
CASS_ID3.2	3	4	PICK_SENS3.2
CASS_ID3.3	5	6	PICK_SENS3.1
CASS_ID3.4	7	8	GND
GND	9	10	CASS_LOW3
LMP3_DRV	11	12	GND
LMP4_DRV	13	14	GND
CASS_ID4.1	15	16	CASS_LOW4
CASS_ID4.2	17	18	GND
CASS_ID4.3	19	20	PICK_SENS4.2
CASS_ID4.4	21	22	PICK_SENS4.1
GND	23	24	GND

Diagnostic Interface

Remote Diagnostics Connector is a 8 way (dual 4) connector, J12.

+5V	1	2	uPTXD
N/C	3	4	uPRXD
TEST RESET	5	6	LED1
GND	7	8	LED2

Firmware Description

The firmware provides the facility to deliver bills from the currency cassettes to the cardholder. This is a single stage operation that picks bills from the selected currency cassette and presenting them to the cardholder.
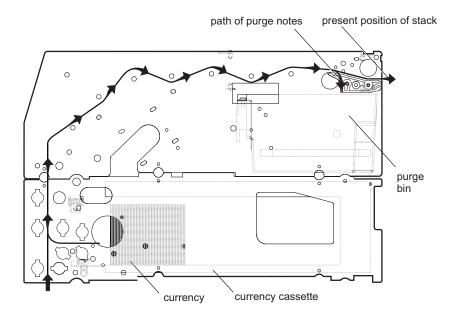
Command	Comments
Status	Reports sensor and cassette related information for the top cassette.
Purge	Attempts to clear the transport of bills.
Dispense	Dispense notes from only the top cassette.
Test Dispense	Picks and rejects notes from only the top cassette.
Reset	Causes a firmware reset of the dispenser
Last Status	Reports the status of the last Dispense, Test Dispense or Purge command.
Configuration Status	Returns the current hardware and firmware configuration, and whether or not this is a multi cassette dispenser.
Sensor Diagnostics	Picks a bill from the top cassette and report its parameters.
Multi-cassette Status	Reports sensor and cassette related information for a multi cassette dispenser.

| Command	Comments
Multi-cassette Purge	Attempts to clear the transport of bills and reports the status per cassette type.
Multi-cassette Dispense	Dispenses bills from more than one cassette in a single transaction and reports the status per cassette type.
Multi-cassette Test Dispense	Picks bills from more than one cassette in a single transaction and reports the status per position.
Multi-cassette Last Status	Reports the last response based on cassette type.
Multi-cassette Sensor Diagnostics	Picks a bill from a specified cassette and report its parameters
Set Opacity	Set the opacity values for each cassette type.
Get Opacity	Reports the configured opacity values.
Set Bill Dispense Order	Sets the dispensing order by cassette types.
Get Bill Dispense Order	Reports the configured dispense order.
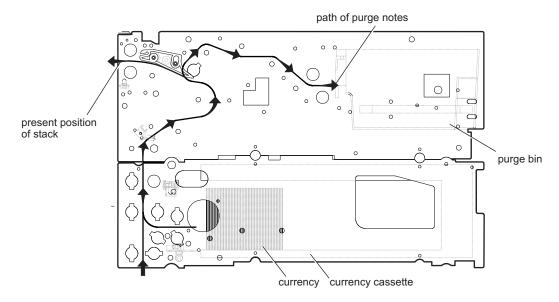
The Dispense Operation

The following description is of a successful dispense operation. It explains the interaction between the firmware and the mechanical and electrical components of the dispenser. The diagram below shows the path taken by the notes through the dispenser:

Front access dispenser

path of purge notes   present position of stack

purge bin

currency   currency cassette

Rear access dispenser

A normal dispense operation consists of picking, transporting and spray presenting individual bills into a customer access tray.

When the dispenser receives a dispense command the firmware first checks the sensors and then turns on the main motor and looks for the location of the first cassette to dispense from. The **main motor** drives the transports in all the pick modules and in the spray module. It also drives the vacuum pump on each pick module. The pick arms of all modules are driven along with the transport. During the firmware search for the cassette the main motor comes up to speed.

The normal dispense operation can be broken down into the following sequence of operations:

- The host ATM issues a dispense command specifying the number of bills to be picked from each cassette. The firmware checks all transport sensors are not blocked and the divert gate is in the reject position. If not, the firmware terminates the operation with an error indication.

- The firmware checks that the first specified cassette is not low on bills. If this cassette is low on bills, the firmware searches for another cassette of the same type (search order is from the top cassette downwards). If another cassette of the same type is found and is not low on bills, it is used. However, if the cassette is also low on bills or another cassette is not found, the first specified cassette is used.

- The transport motor is switched on and the pick solenoid of the selected cassette is energized to provide vacuum to the pick mechanism suction cups.

- The selected pick module picks a bill which is fed through the module pick sensor to the transport section. As the bill passes through the pick sensor, the sensor output is used to check that a single bill has been picked. This is achieved by:

  — Measuring and comparing the bill opacity threshold with the relevant opacity value stored in RAM. If four consecutive readings are below the threshold, the bill is determined to be a double bill.

  — Detecting the leading and trailing edges of the bill, to check the width of the bill against a fixed value maintained by the on board firmware. If the bill is determined to be a double, oversize, undersize or an extra bill, it is recorded as bad; otherwise it is good.

- The picked bill is transported through the count sensor to the divert gate. If the bill is:

— Good, the divert solenoid is energized to pass the bill through the exit sensor to the customer access tray. The solenoid remains energized as long as good bills are sensed.

— Bad, the solenoid de-energizes to pass the bill through to the reject bin overfill sensor to the reject bin.

- As the picked bill travels through the dispenser, its passage is monitored by the pick, count, reject bin overfill and exit sensors. These sensors control the following jam timers:

— Time under pick sensor

— Time from pick sensor to count sensor

— Time under count sensor

— Time from count to reject overfill

— Time under reject overfill sensor

— Time from count to exit sensor

— Time under exit sensor.

If any predetermined bill passage time is exceeded, a jam is deemed to have occurred and the operation is terminated with an error indication.

- The process of picking bills is repeated until the bill count of good bills at the pick sensor equals the dispense command bill count.

- A status message is transmitted to the host ATM.

Chapter 2
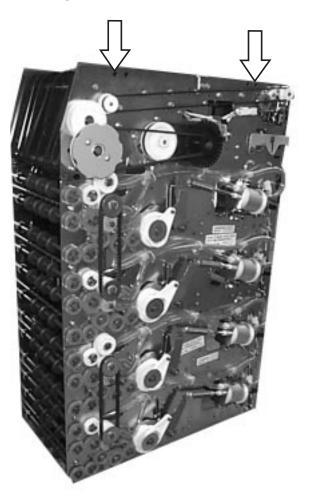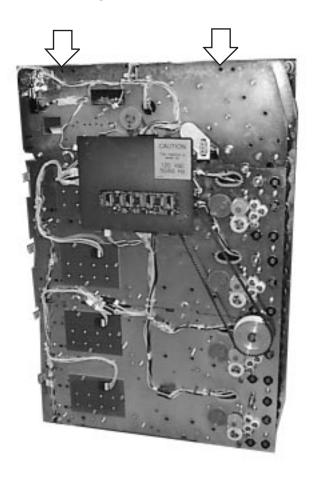# Installation

Mounting Dispenser

The dispenser is designed to be mounted in a host ATM. There are two methods of mounting the dispenser, at the top or at the bottom.

Top mounting is achieved using four M6 screws, two on either side of the dispenser. There are two pairs of holes provided on each side but only one from each pair needs to be used to mount the dispenser.
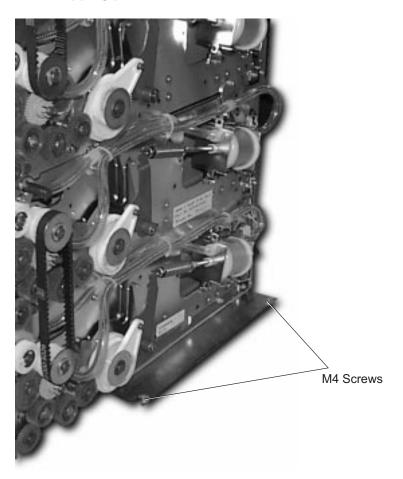
Left side mounting locations.

Right side mounting locations

Bottom mounting is achieved using four M4 screws two on either side of the dispenser. The dispenser is attached to its shipping pallet via these holes.

M4 Screws

Power Connection

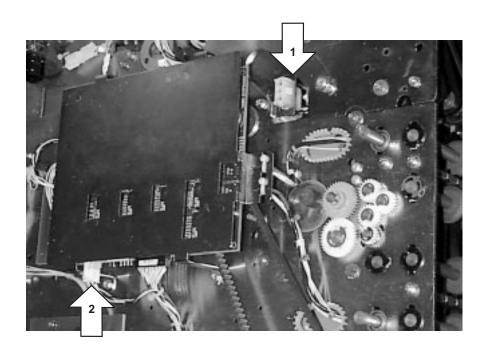The power for the dispenser must conform to the
following specification:

- AC Power (1)
  - 115VAC 5.5A RMS 20A surge
  - 230VAC 3A RMS 10A surge

Live	1
Earth	2
Neutral	3

- DC Power (2)
  - +5V $\pm$ 5% 1.5A
  - +24V $\pm$ 5% 2A

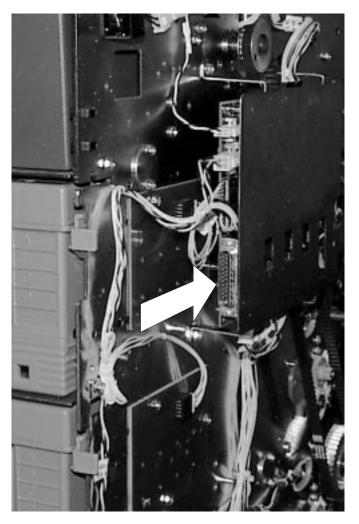|	
GND	1
+5V	2
GND	3
+5V	4
KEY	5
GND	6
+24V	7

The power connection is located as follows:

Interface Connection

The dispenser interface connector is positioned at the bottom of the control board. It is a 25-way male D-type connector.

The pin connections are as follows

XRES	13	25	COMM_ID1
COMM_ID0	12	24	GND
E1	11	23	COMM_S1
GND	10	22	COMM_S0
E0	9	21	DB
N/C	8	20	+5V
GND	7	19	DA
N/C	6	18	OOO
CTS	5	17	LRTS
RTS	4	16	LCTS
RXD	3	15	LTXD
TXD	2	14	LRXD
N/C	1		

Electrical Connections

This interface is designed to the EIA RS 232 C standard. The dispenser is configured as DTE (data terminal equipment) and uses a subset of the handshake circuits.

RS 232 C is the default interface if no selection or enable links are present. The connector configuration for this interface is as follows:

Pin 1	SCRN	Cable screen
Pin 2	TXD	Transmitted data, FROM the dispenser
Pin 3	RXD	Received data, TO the dispenser

Pin 4	RTS	Request to send, FROM the dispenser. This circuit will become active (ON, +10V) when the dispenser is waiting to transmit.
Pin 5	CTS	Clear to send, TO the dispenser. This circuit is made active by the host controller in response to an ON state on RTS. The dispenser will only transmit after the CTS is active. Deactivating CTS in the middle of a message will temporarily halt the transmission until both RTS and CTS become active again.
Pin 7	GRD	Communications ground

Pins 2, 3, 4, 5 and 7 should be connected to their namesakes on a DCE (data communication equipment) interface. If the RTS and CTS handshake option is not required, pins 4 and 5 must be connected together.

The polled interface may be selected by linking pin 22 to pin 10. In this case the transmitter must be enabled by linking CTS to RTS (pins 4 and 5) and a communications identity address must be selected using pins 12, 24 and 25.:

Identity	Pin 12 (ID0)	Pin 25 (ID1)
0 (30H0		
1 (31H)	Pin 24	
2 (32H)		Pin 24
3 (33H)	Pin 24	Pin 24

Electrical Characteristics of Interfaces

The signal ground connection on pin 7 is connected to the dispenser ground via a 100 ohm series resistor. If this causes unacceptable voltage loss, pin 10 may be used instead. This provides a direct connection to the dispenser ground but may reduce noise immunity.

The logic level interfaces are designed to use the standard TTL voltage thresholds (High, greater than 2V; Low, less than 0.8V).

Note: The voltage on the logic interface must not exceed the dispenser's 5V supply voltage by more than 0.5V.

The host's input circuits may be standard TTL, no pull-up resistors are required. However, any pull-ups used must be at least 1K any pull-downs used must not exceed 1K.

The dispenser has two types of input circuit:

● The RXDL circuit may be driven by a standard LSTTL output, the input incorporates a TTL gate with a 10K pull-up.
● The CTSL (and RST) input incorporates an HCT TTL gate with a 1K pull-down resistor. This circuit may be driven by an open-collector TTL driver (for example, 7407) with a 470R pull-up resistor.

Note: If the handshake circuits are not used (CTSL and RTSL), then the standard LSTTL devices are capable of driving the interface.

Chapter 3

Operating Instructions

Table of Contents
Operating Instructions

Replenishing the Currency Cassettes

Before loading the currency into a cassette, it must be prepared correctly as follows:

Used currency should be prepared by holding a bundle of approximately 100 notes in one hand and separating out with the other. While separating out, the currency should be checked for obvious defects such as:
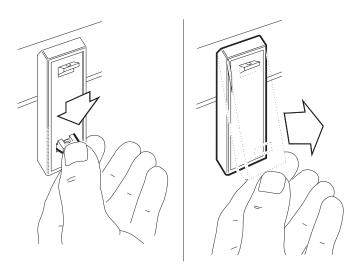
- Adhesive tape on the surface of the currency
- Staples, pins or any foreign matter attached to the currency
- Torn or limp notes with pin holes
- Two or more notes stuck together
- Corner folds (straighten as required)
- Folded notes.

New or uncirculated currency should be separated (fanned) out several times before loading into the cassette. Any notes considered unacceptable should be removed.
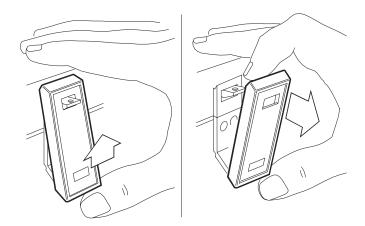
To replenish the money in the currency cassette proceed as follows:

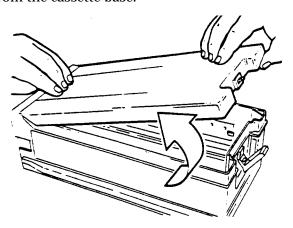1   Lift the catch on the right-hand side of the currency cassette and pull the cassette out of the terminal.

2 Push the cassette latch hasp down and then pull the bottom of the latch towards you

3 Lift the latch up a small amount. Pull the top of the latch towards you then hinge it down.
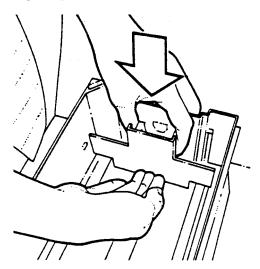
4 Raise the lid and, applying slight pressure at the front of the lid to help disengage the tags, remove the lid from the cassette base.
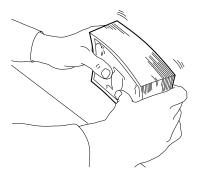
5 Lift the pusher arms and move the pusher to the rearmost position by pushing against the pusher.

NCR 5633 Currency Dispenser Service Manual

6   Latch the pusher in the rear position by applying
     gentle pressure near the base of the pusher, then
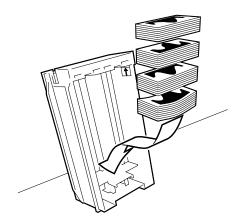   releasing the pusher arms.

7   Align the edges of the notes in both planes by
     holding a bundle loosely between the fingers and
     thumbs of both hands and tapping lightly on a flat
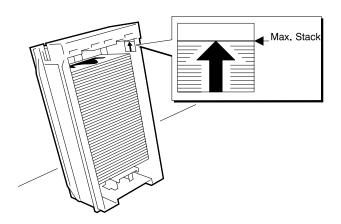   surface, then tapping the note ends.

8 It is recommended that the cassette be placed at an angle so that each note stack can be loaded without it falling over. For example, stand the cassette at an angle and against a wall as shown. Load the notes into the cassette.

Note: When loading the cassette alternate packs/bundles of 100 notes as shown, and make sure that any bowed notes are loaded with the bow towards the pusher.
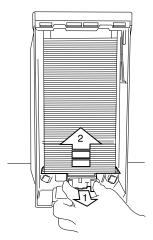
9 Continue loading until the required amount is loaded, or an 11.6 in. stack is loaded. This maximum stack size is indicated by the maximum load point label on the inside of the cassette.

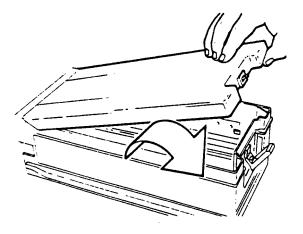**10** Lift the pusher arms and push the pusher and the note stack upwards until the currency stack touches the front support, then release the pusher arms. The
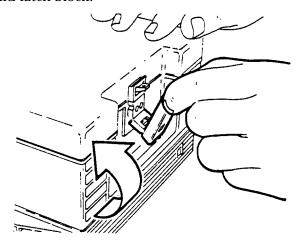
currency should remain between the front support and the pusher in an upright position, neatly stacked between the cassette guides.
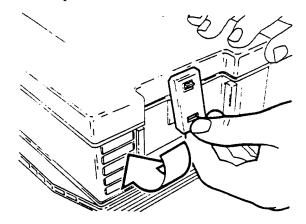
11 Insert the tongues on the cassette lid into the slots in the cassette base as shown and then lower the lid on to the cassette base.

12 Lift the latch up and forward until it hooks on to the lid latch block.

13 Pull the latch down and forward until it clicks into the locked position.

14 If required, seal latch.

15 Push the refilled cassette firmly into the dispenser until it clicks into place.

Emptying the Purge Bin

To empty the purge bin proceed as follows:

1 Lift the latch on the left-hand side of the currency purge bin and then pull the bin out of the terminal.

2 Remove the purged currency from the bin. Note that this currency is still classed by the terminal as being available to the customer. Unless the currency is damaged or of poor quality it should be replaced in the cassette for dispensing. Damaged or poor quality notes should be replaced by notes of an acceptable quality.

3 Slide the empty bin back into the terminal until it clicks in place.

Clearing Dispenser Jams

The procedure for clearing a jam depends on where the jam is within the dispenser:

● The pick module
● The spray module.

Pick Module

The jam can be at any of the cassettes present in the dispenser.

1   Lift the catch on the right side of the currency cassette and pull the cassette out of the terminal.

2   Reach inside the hole vacated by the cassette and remove any jammed bills.

3   Push the cassette back into the dispenser until it latches into place.

Main Transport

1   Look in the transport on top of the spray module to locate the jammed bill.

2   Carefully remove the jammed bill from within the transport.

3   Once the bill has been removed from the transport, make sure that the transport belts are still located on top of the pulleys.

Chapter 4

Maintenance Instructions

Calibrating the Dispenser

For proper operation of the currency dispenser, the correct opacity setting must be configured correctly. Otherwise there is a risk of dispensing double notes.

The following procedure shows how to determine the opacity thresholds and how to set them using the opacity switch packs.

Preparation

The following must be available before commencing the calibration of the dispenser:

Equipment:

●   Dispenser
●   Power Supply
●   PC loaded with the rework tool
●   RS232 cable attached to PC and dispenser
●   Currency Cassette configured for the notes under test
●   Thirty two notes made up as described below.

Configure the dispenser and the PC as described in the *NCR 5301 Currency Dispenser Rework Support Tool User Guide.*

Check the communications switch pack is set to the default values of switches 1, 2 and 3 down with all others up. The communication switch-packs are U15 on the two-high control board and U35 on the four-high control board.

Currency

Note: It is important that the notes used are new notes since these are generally lighter than used notes. Using used notes may result in an opacity threshold which is lower than a value which new notes can give.

The opacity thresholds must be performed for each denomination of the currency to be dispensed. Different denominations of notes must not be mixed in a single cassette. Also different issues of a denomination may be different physical parameters and they must not be mixed if the opacity values are different.

It is necessary to prepare doubles using all possible combinations of note orientation. Since each note can be oriented in four different positions within the cassette, the total number of combinations is sixteen. To prepare all of these combinations, first layout sixteen single notes in the orientations shown in layer 1, then add a second layer of single notes in the orientations shown in layer 2. This will produce the required sixteen different orientations of doubles. These should be taped together along the leading edge with a gap at the middle where the note passes over the pick sensor.

Layer 1	A	B	C	D	A	B	C	D
Layer 2	A	A	A	A	B	B	B	B

Layer 1	A	B	C	D	A	B	C	D
Layer 2	C	C	C	C	D	D	D	D

Where:

A	Front Side Up, Correct orientation
B	Front Side Up, Opposite orientation
C	Reverse Side Up, Correct orientation
D	Reverse Side Up, Opposite orientation

Running The Test

1   Power on the dispenser and the PC.

2   Load the cassette with the sixteen double bills at the front of the cassette and insert in the top pick module.

3   Run the rework tool by selecting the Hawk icon on the desktop or clicking on the Start Menu, then Programs menu then Hawk.

4   From the main menu screen select the Single Denomination Option by pressing function key **F1** or by clicking on the Single Denomination button.

5   Select sensor diagnostic command by pressing function key **F6** or by clicking on the Sensor Diagnostic command button. The dispenser will perform a divert gate test and also pick and purge a note. The response reported on the screen displays the opacity value (as a hex number and a decimal number in parenthesis after it) along with the bill width and the divert gate timing. Record the opacity value.

6 Repeat for all doubles and record the opacity value from each command.

Note: The above procedure is required to be performed for each denomination of currency to be dispensed. Different denominations of notes must not be mixed in a cassette.

Determine Threshold

Take the highest value obtained from the sixteen doubles and add four to it. This is now the opacity threshold value for that denomination **only**. This value should be converted to an eight-bit binary pattern to determine the opacity switch pack setting. This is the pattern that should be set on the switch-pack, where there is a binary 0 the switch should be off (up) and where there is a binary 1 the switch should be on (down). The least significant bit on the switch pack is switch 1 and the most significant bit is switch **8**. The switches are numbered on the switch-pack as 1 to 8 and switch 1 is at the bottom of the switch-pack when the board is mounted on the dispenser.

For example:

The opacity threshold for US dollars is 0DH (13_{10}). When expressed as a binary pattern this is:

00001101.

This results in a switch pack setting of switches 1,3 and 4 on and all others off.

Configuring Opacity Threshold

The opacity threshold is configured by setting a switch pack on the dispenser control board. The correct switch pack to set is determined by the following rules:

● If the dispenser is being used as a De La Rue replacement with only the standard Single Denomination Dispense commands being used then switch-pack for type 1 is always used. With these commands notes are only dispensed from the top pick module and any other cassettes are ignored. The switch packs used on the two and four high boards are:

2 high	U28
4 high	U34

● If the extended "multi-cassette" command set is used the switch packs always refer to the cassette type. The switch packs used on the two and four high boards are:

2 High	4 High	Cassette
U28	U34	Type 1
U23	U25	Type 2
	U25	Type 3
	U17	Type 4

Note: On a two high dispenser currency cassette types 3 and 4 can be used, however the Set Opacities command must be used to configure the thresholds otherwise all notes will be rejected. The Get Opacities command can be used to confirm the threshold(s) being used. If the values have been configured using the Set Opacities command (on either type of board) then these will be stored in NVRAM and used in place of the values set on the switch packs.
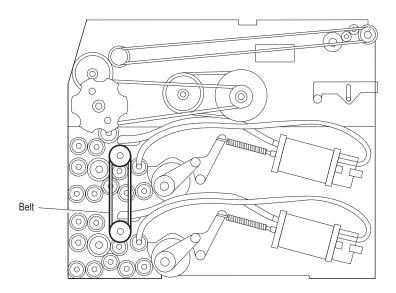
Dispenser Adjustments

This section describes the adjustments for the dispenser.
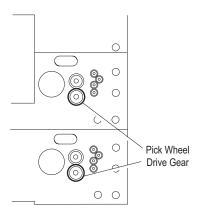
Internal Timing of Each Pick Module

This sets the relationship of the pick arms to the pick wheels.
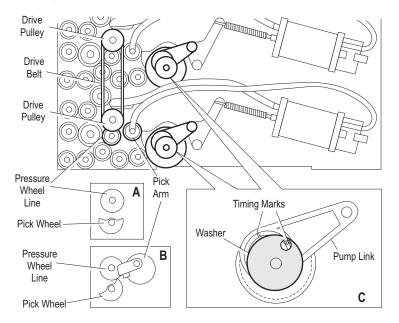
1   If two pick modules are fitted, remove the drive belt shown.

Belt

2   On the other side of the pick module, remove the
drive gears from the pick wheel lines as shown:

Pick Wheel
Drive Gear

3   Turn the pick wheel line in the upper (or only) pick
module until the pick wheels are not touching the
pressure wheels as shown in detail **A**:
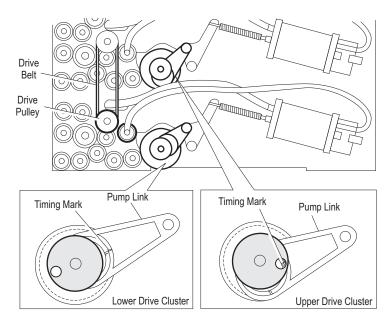
4   Manually turn the drive pulley until timing mark
"D" is aligned with the mark on the pump link, as
shown in detail **C**.

5   Turn the pick wheel line until the cut away portion of
the pick wheels face the front of the module and the
leading edge of the pick wheels just touch the
pressure wheels, as shown in detail **B**.

6 On the other side of the module, align the notches in the pick wheel drive gear with the pin in the pick wheel line and slide it on the shaft, being careful not to move the pick wheel and pressure wheel lines. Replace the retaining clip.

7 Repeat steps 3 to 6 for the lower pick module, if fitted.

Relative Timing of Pick Modules

If two pick modules are fitted, this adjustment sets the relative timing of the pick modules with each other.
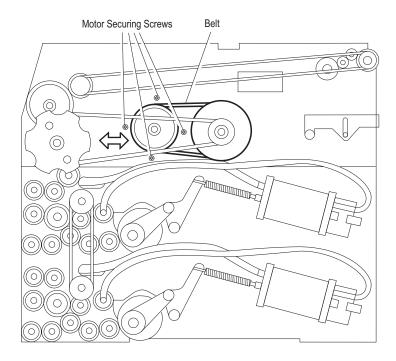
1 On the **upper** pick module, rotate the drive pulley until the timing mark "U" is aligned with the pump link timing mark.

2   On the **lower** pick module, rotate the drive pulley
     until the timing mark "L" is aligned with the pump
     link timing mark.

3   Refit the drive belt, ensuring that the alignment of
     steps 1 and 2 are maintained.

Main Motor Drive Belt Tension

On the spray module, loosen the transport motor
mounting screws.

Motor Securing Screws   Belt
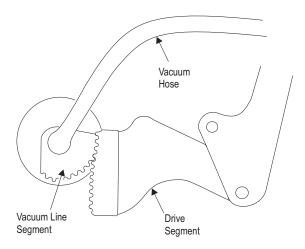
1   Adjust the belt tension to give a mid-span deflection
     of **3mm** (0.12in) for a force of 3 Newtons applied at
     mid-span.

2 Maintaining this adjustment, tighten the transport motor mounting screws.

Drive Segment Timing

This is to clarify the correct position of the pick module drive segment with respect to the vacuum pick line segment.
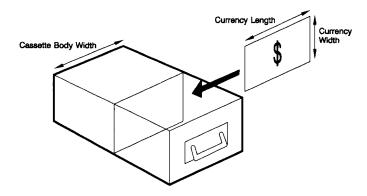
Note: The teeth of the drive segment must be above the vacuum line segment teeth.

Cassette Adjustments

Note: The terms "left" and "right" in the following adjustments and tables of settings apply to the cassette when looked at from the front (the truck door end).

You will have to move the pusher during some of the following adjustments, refer to the caution given in the section "Pusher Operation."

Four mechanical adjustments are provided:

● Currency length (across the width of the cassette)
● Currency width (the internal height of the cassette)
● Note low sensing (two values)
● Cassette identification code (four values).

Currency Length Adjustment
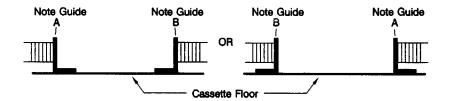
The note guides in the body of the cassette bear against spacer blocks known as E spacers. These blocks have to be cut to certain lengths so that the note guides are supported the correct distance apart corresponding to the length of the currency being dispensed. To simplify the task of fixing the position of the note guides, the

currency length is translated into note guide and E spacer codes read off from the table given under the heading "Currency Length Guide Codes and E Spacer Settings." The codes correspond to markings on the floor of the currency compartment, on the note guides themselves, and on the E spacers.

Note Guides - Currency Length

A pair of note guides is marked with the letter A on one and B on the other. The guides can be used in either the left or right position as shown in the following diagram. This gives the full currency length range of:

● 120 mm (4.72 in.) to 172 mm (6.77 in.)
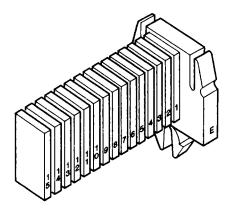
The letters A and B in the columns of the code table tell you which guide has to be placed to the left and which to the right. The number 1 to 12, after the letter, corresponds to the numbers embossed on the floor of the currency compartment at front and back. A triangular pointer at the front of the note guide and a triangular mark at the rear should line up with the same number as given in the look-up table.

Note: The spring fingers on the note guide are at the front (truck gate) end.

E Spacer - **Currency Length**

The spacer shown in the following figure is embossed on one side with the letter E and the numbers 1 to 15 and is known as the E spacer. The E spacer is designed to snap-in to position without the use of tools.

The E spacer codes in the table tell you where to cut the two right-hand and two left-hand E spacers. You cut off the segments with higher numbers than the code. The procedure and example given after the code table should make this clear.

Guide and E Spacer Setting

Currency Length		Note Guide		E Spacer	
mm	in.	L.H	R.H	L.H.	R.H
120	(4.72)	B3	A3	E9	E9
121	(4.76)	B3	A3	E9	E9
122	(4.80)	B3	A3	E9	E9
123	(4.84)	B4	A3	E8	E9

Currency Length		Note Guide		E Spacer	
mm	in.	L.H	R.H	L.H.	R.H
124	(4.88)	B4	A3	E8	E9
125	(4.92)	B4	A4	E8	E8
126	(4.96)	B4	A4	E8	E8
127	(5.00)	B4	A4	E8	E8
128	(5.04)	B5	A4	E7	E8
129	(5.08)	B5	A4	E7	E8
130	(5.12)	B5	A5	E7	E7
131	(5.16)	B5	A5	E7	E7
132	(5.20)	B5	A5	E7	E7
133	(5.24)	B6	A5	E6	E7
134	(5.28)	B6	A5	E6	E7
135	(5.32)	B6	A6	E6	E6
136	(5.36)	B6	A6	E6	E6
137	(5.40)	B6	A6	E6	E6
138	(5.44)	B6	A6	E6	E6
139	(5.48)	A5	B5	E5	E5
140	(5.52)	A5	B5	E5	E5
141	(5.56)	A5	B5	E5	E5
142	(5.60)	A5	B5	E5	E5
143	(5.64(	A5	B5	E5	E5
144	(5.68)	A6	B5	E4	E5

Currency Length		Note Guide		E Spacer	
mm	in.	L.H	R.H	L.H.	R.H
145	(5.72)	A6	B5	E4	E5
146	(5.76)	A6	B6	E4	E4
147	(5.80)	A6	B6	E4	E4
148	(5.83)	A6	B6	E4	E4
149	(5.87)	A7	B6	E3	E4
150	(5.90)	A7	B6	E3	E4
151	(5.94)	A7	B6	E3	E4
152	(5.98)	A7	B7	E3	E3
153	(6.02)	A7	B7	E3	E3
154	(6.06)	A8	B7	E2	E3
155	(6.10)	A8	B7	E2	E3
156	(6.14)	A8	B8	E2	E2
157	(6.18)	A8	B8	E2	E2
158	(6.22)	A8	B8	E2	E2
159	(6.26)	A9	B8	E1	E2
160	(6.30)	A9	B8	E1	E2
161	(6.34)	A9	B9	E1	E1
162	(6.38)	A9	B9	E1	E1
163	(6.42)	A9	B9	E1	E1
164	(6.46)	A10	B9	E	E1
165	(6.50)	A10	B9	E	E1

Currency Length		Note Guide		E Spacer	
mm	in.	L.H	R.H	L.H.	R.H
166	(6.54)	A10	B10	E	E
167	(6.58)	A10	B10	E	E
168	(6.62)	A10	B10	E	E
169	(6.66)	A11	B10	Nil	E
170	(6.70)	A11	B10	NIl	E
171	(6.74)	A11	B11	NIl	NIl
172	(6.78)	A11	B11	NIl	NIl

Procedure

The procedure for adjusting the cassette to currency length is as follows:
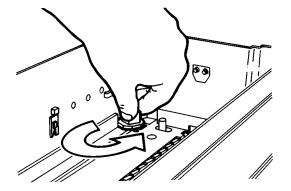
1 Measure the length of the currency.

2 Read off the E spacer codes from the table.

3 Cut the E spacers.

4 Insert the E spacers in the cassette.

5 Put the note guides into the cassette.

6 Check that the triangular parts on the note guides point to the numbers on the floor of the cassette corresponding to the note guide codes.

Example
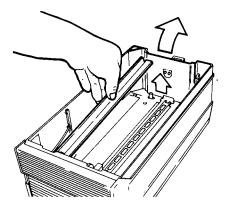
The following example adjusts the cassette for currency 120mm (4.72in) long.

Proceed as follows:
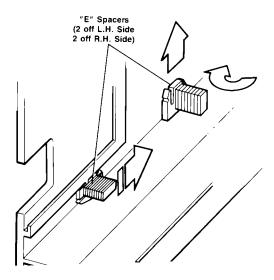
1   Measure the length of the new currency (120 mm).

2   Refer to the code table and, using the currency length, read the guide code and the E spacer setting for the currency. For 120 mm the left hand guide code is B3 and the right hand guide code is A3. The spacers have a setting of E9 for the left hand guide and E9 for the right hand guide.

3   Move the pusher fully forward.

4   Unscrew and remove the clamps securing the note guides to the cassette floor.
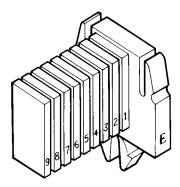
5   Slightly raise the rear end of the guide over the
    embossed numbers, push the guide towards the rear
    and lift it out of the cassette. Take care not to damage
    or bend the spring fingers.

6   Unclip and remove the four E spacers from the base
    of the cassette. Turn the two E spacers at the handle
    end of the cassette through 90 degrees before pulling
    upwards.

"E" Spacers
(2 off L.H. Side
2 off R.H. Side)
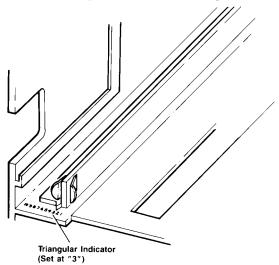
7 Hold a new E spacer on a work surface so that the letter E and the numbers 1 to 15 can be read

8 Use a sharp knife to cut the spacer just above the number 9so that you are left with a spacer that has the letter E and segments up to number 9.

9 Cut three more E9 spacers (see the following illustration) to give you two for the right-hand side and two for the left-hand side.
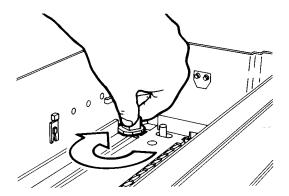
10 Flush the spacer cut surfaces by removing any burrs left after cutting.

11 Snap-in the four new E spacers in the correct positions in the floor of the cassette.

12 Insert the note guides back into the cassette hard against the E spacers. Check that the pointers at either end of the guides are pointing at the code numbers for the new currency. For this example the left hand guide (B) should be pointing at the number
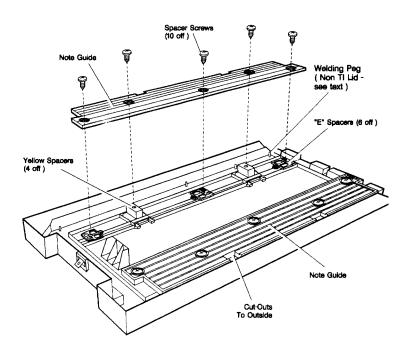
3 and the right hand guide (A) should also be pointing at the number 3. Refer to the following figure for an example of the left hand guide.

Triangular Indicator
(Set at "3")

13 Screw in the note guide clamps until they are finger tight.

Currency Width
Adjustment

Currency widths between 55 mm (2.17 in.) and 100 mm (3.94 in.) can be accommodated in the cassette. The currency width adjustment is made by cutting the ten spacers between the upper note guides and the lid. Six of these spacers are the same as the currency length E spacers and four are known as yellow spacers. Each note guide has three E spacers and two yellow spacers screwed to it. The yellow spacers clip into the lid to fasten the note guide assemblies to it.

The spacers are embossed with letters and numbers along the sides. You cut away segments to leave only the ones with the code numbers read from the "Currency Width Spacer Codes" table. The procedure and example given after the code table should make this clear.

Currency Width Spacer Codes

Currency mm	Width in	Yellow Spacer Code	E Spacer Code
55	(2.17)	C12	E15
56	(2.20)	D11	E14
57	(2.24)	D11	E14
58	(2.28)	C11	E14
59	(2.32)	D10	E13
60	(2.36)	D10	E13
61	(2.40)	C10	E12
62	(2.44)	D9	E12
63	(2.48)	D9	E12
64	(2.52)	C9	E11
65	(2.56)	D8	E11
66	(2.60)	D8	E11
67	(2.64)	C8	E10
68	(2.68)	D7	E9
69	(2.72)	D7	E9
70	(2.76)	C7	E9
71	(2.80)	D6	E8
72	(2.83)	D6	E8
73	(2.87)	C6	E8
74	(2.91)	D5	E7

Currency mm	Width in	Yellow Spacer Code	E Spacer Code
75	(2.95)	D5	E7
76	(2.99)	C5	E6
77	(3.03)	D4	E6
78	(3.07)	D4	E6
79	(3.11)	C4	E5
80	(3.15)	D3	E5
81	(3.12)	D3	E5
82	(3.23)	C3	E4
83	(3.27)	D2	E3
84	(3.31)	D2	E3
85	(3.35)	C2	E3
86	(3.39)	D1	E2
87	(3.43)	D1	Nil
88	(3.46)	C1	Nil
89	(3.50)	D	Nil
90	(3.54)	D	Nil
91	(3.58)	C	Nil
92	(3.62)	Nil	
93	(3.66)	Nil	
94	(3.70)	Nil	
95	(3.74)	Nil	

Currency mm	Width in	Yellow Spacer Code	E Spacer Code
96	(3.78)	Nil	
97	(3.82)	Nil	
98	(3.86)	Nil	
99	(3.90)	Nil	
100	(3.94)	Nil	

Procedure

Adjust the cassette for currency width as follows:
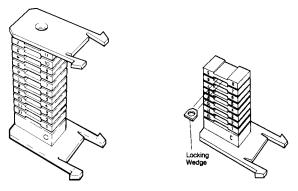
1   Measure the width of the currency.

2   Read off from the table the codes for the E spacers and yellow spacers.

3   Cut six E spacers and four yellow spacers.

4   Put a locking wedge into the first gap in each of the yellow spacers. Lubricate the wedge with soap to ease insertion.

5   Clip the yellow spacers into their locations in the cassette lid.

6   Screw three E spacers to each note guide.

7   Screw the note guides to the yellow spacers with the cut outs in the note guides facing out.

Example

This example adjusts the cassette for currency 67 mm (2.64 in.) wide:

1   Open the cassette and remove the lid.

2   Remove the two note guides from the lid by undoing the cross head screws from the Yellow spacers then remove the E spacers from the note guides.

3   Remove the Yellow spacers from the lid by pressing in the two spring legs of each spacer then pushing them out of the lid.

4   Measure the width of the new currency.

5   Read the spacer codes for that currency width from the code table.

6   Set four new Yellow and six new E spacers to their spacer codes. For 67 mm the Yellow spacer should be set to C8 and the E spacer to E10.

7   Put the spacers on a work surface so that you can read the letters and numbers embossed on their sides.

8   The E spacers have the letter E and the numbers 1 to 15 embossed on them (refer to the example given in the currency length adjustment). The code E10 means that the E spacer is to be cut just above the number 10. Use a sharp knife to cut the six E spacers.

9   The Yellow spacers are embossed on one side with
    two sets of numbers 1 to 12 reading in opposite
    directions. One end has the letter C on it and the
    other has the letter D (see the illustration below). For
    the code C8 you count from the C end and, with a
    sharp knife, cut the spacer just above the number 8 so
    that you are left with end C and segments 1 to 8.

10 Flush the spacer surfaces by removing any burrs left
    after cutting.

11 Fit a locking wedge into the first gap in the cut
    yellow spacer (see the following illustration).

12 Install the four new Yellow spacers by pressing the
    legs of the spacer together and pushing them into the
    apertures in the cassette lid.

13 Screw three new E spacers to each lid note guide.

14 Screw the lid note guides to the yellow spacers on the
    lid (make sure the cut outs on the note guides are
    facing out).

Matching Cassette Bodies And Lids

Prevent lids being put on bodies set for a different currency by one of the recommended marking systems:
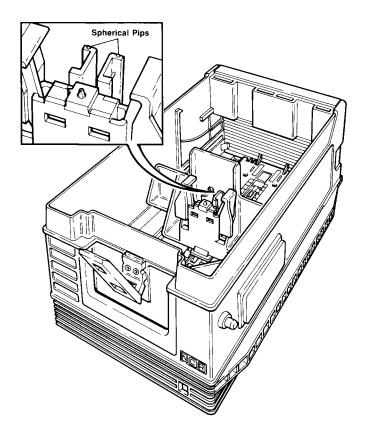
● Apply small stick-on labels of the same colour to the lid and the body

● Write the currency value in indelible ink on the interior surfaces of the lid and the body

Note Low Sensing Adjustment

The note low block provides the dispenser subsystem with an indication of a note low condition. The block can be set to give two note low settings:

● 75 ± 50 notes

● 200 ± 50 notes
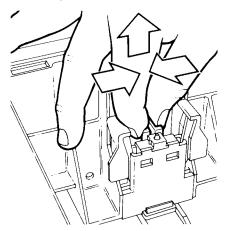
The settings are indicated by spherical pips on the flaps of the block. If the pips are towards the truck door end of the cassette, it is set for the 75 note setting. If the pips are

set towards the handle of the cassette then it is set for the
200 note setting (refer to the following figure).
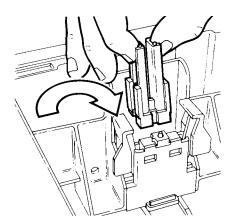
To change the note low setting proceed as follows:

1   Open the cassette and remove the lid.
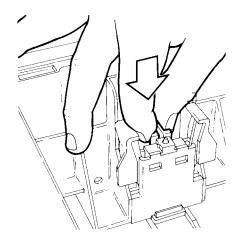
2   Press the flaps of the note low block together until
they touch then pull the block upwards and out of
the pusher body.

3   Turn the block around so that the pips face the
opposite way then insert the block back into the
pusher.

4 Press down firmly until the block clicks into place.
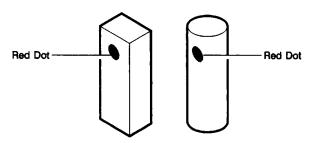
Cassette Identification Code

This section explains how to place the magnets on the cassette to achieve the identification codes.

Magnet Marking and Position

It is essential that the magnets are pointing in the correct direction, therefore, each magnet has a marked end, a red dot, to indicate which way round it should be installed in the housing.

Note: Early magnets were square section. Both types are interchangeable.

The following table shows the location and orientation of the four magnets to produce the four cassette identification codes. The "magnet position" in the table corresponds to the numbers 1 to 4 moulded into the plastic inside the housing.

| | Magnet Position | | | |
Cassette Type	1	2	3	4
1	$\overline{X}$	$\overline{X}$	0	0
2	$\overline{X}$	0	0	$\underline{X}$
3	$\overline{X}$	0	X	0
4	$\overline{X}$	$\overline{X}$	$\underline{X}$	$\underline{X}$

Note1 X = magnet inserted, 0 = magnet not present.

Note 2 The bar above or below the X indicates whether the magnet should be placed in the housing with the marked end up or down respectively.
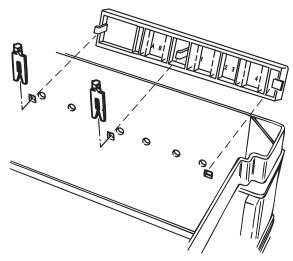
Note 3 Although seven binary codes are possible with the three positions of magnets, those shown are the only ones recognized by the dispenser subsystem. Any other code set in will not be identified.

Example

When it is required to change the identification code of a cassette, for example a cassette set to code 1 to code 3 so that two cassettes can dispense notes of the same denomination, perform the following procedure:

1   Open and remove the cassette lid.

2   Release the clip holding the plastic housing to the cassette side frame and remove the plastic housing complete with the magnets from the cassette.

3   Remove the magnet from position 2.

4   Replace the magnet in the housing in position 3 with the red dot facing down to set the cassette code to type 3. There should be no magnets in positions 2 and 4.

5   Attach the housing complete with the magnets to the cassette frame using the clip released in step 1. The housing should be inserted with the longer of the two legs towards the handle end of the cassette.

6   Close the cassette lid.

Preventative Maintenance

At each service call the Field Engineer should carry out cleaning tasks and check for wear on timing belts and moving parts. Particular attention should be paid to the pick arm suction cups.

Note: Vacuum the dust from all areas of the currency dispenser.

Pick Modules

● Check that the reed switch housing is not cracked (replace if necessary)

Note: A note low condition may not be identified if the read switch housing is damaged.

● Inspect the pick lines for broken nozzles. Replace the pick line if broken, cracked or bent
● Check and replace suction cups if necessary. Read the "Suction Cups" section shown over
● Check alignment and clean incandescent lamp and sensor
● Inspect the dispenser for worn or broken gears. Replace gears where necessary. If gears are worn, check that all circlips on the associated shaft are in place. Lateral movement of shafts occur (accelerating gear wear) when circlips fall off
● Lubricate the pick modules and check their mechanical adjustment; refer to the "LUBRICATION" section in this chapter.
● Ensure pick modules are properly timed.

Suction Cups

The following information is provided as a guide to formulating replacement schedules for individual ATMs:

● Lower usage ATMs (150 dispense operations daily, 1 bill per pick module per operation); replace suction cups annually

● Medium usage ATMs (250 dispense operations daily, 2 bill per pick module per operation); replace suction cups every six months

● Higher usage ATMs (350 dispense operations daily, 3 bill per pick module per operation); replace suction cups every three months.

Currency/Media Containers

Clean the purge bin and all cassettes (including spare cassettes) both inside and out.

Note: Pay particular attention to the front door of the cassette.

Lubrication

This section describes the lubrication of the currency dispenser during component replacement.

Lubricant Type

The following lubricants are recommended:

Lubricant	Type
A	No.2 General Purpose Oil
B	Synthetic Lubricating Grease (NCR Part No. 009-0004618 = 100gm containers)

For No.2 General Purpose Oil any one of the following lubricants can be used:

● Shell Oil Co. Donax T-6
● Mobil Oil Co. Mobil ATF 220
● Exxon Oil Co. ATF or Esso ATF.

General Instructions

The following general instructions must be observed:

1 Use clean lubricants from properly labelled containers.

2 Satisfactory operation of mechanical components depends upon proper lubrication. Follow the specific lubrication instructions in the following paragraphs in detail.

3 Avoid excessive lubrication. Apply only that amount which will provide a thin coating on the entire bearing area or surface, unless otherwise specified.

4   All parts to be lubricated must be free from dust, corrosion and metal chips.

5   Lubricate bearing areas and surfaces during assembly, unless conditions caused by subsequent handling are detrimental (for example, accumulation of chips, grit, and so on) to the proper operation of the part. In those cases lubrication should be applied after assembly.

6   Apply lubricants using the most convenient method when none is specified, that is by brushing, dipping, or oil can. Spraying is not recommended.

7   Lubricate all spring hooks and spring studs with lubricant B.

8   Working clipped or riveted assemblies should not be lubricated before riveting but only after all processes, handling, or storage involving exposure to dirt or serious atmospheric contamination are past.

9   On assemblies that have shafts on which one or more moving parts are assembled, lubricate both the shaft and the hub areas on each part with the specified lubricant.

10   Lubricants can cause serious deterioration of rubber. Avoid contamination of drive belts and drive rolls.

Caution   Make sure that no lubricant spills on to the teeth of gears as this may impair their performance.

Spray Module

Lubricate as follows:

● All plastic bearings (before assembly) - with A.

Pick Module

Lubricate as follows:
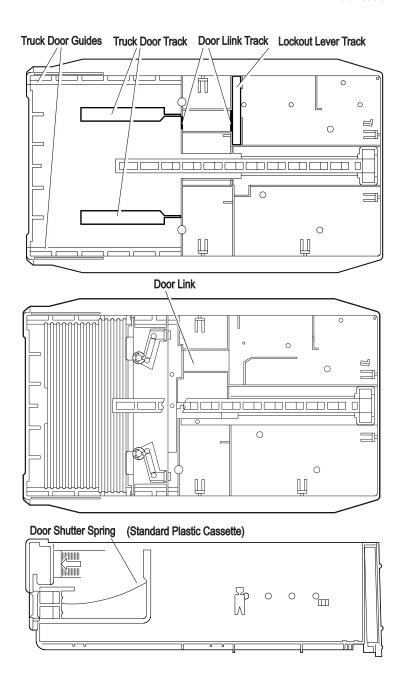
● Drive segment, inside hub, pivot stud - with A
● Gears turning on stationary stud, on the stud, in the bore - with B
● Cam cluster, bore and pivot stud - with B
● Pick line, bearing faces - with B
● Pick line hub bearing surface - with B
● Plastic bearings (before assembly) - with A
● Cassette latch stud - with B.

Cassette

Lubricate the cassette as follows with B
(see the shaded parts of the illustrations below):

● Base plastic moulding:
    ● Truck door guides and track
    ● Lockout lever track
    ● Door link track.
● Door link (both sides at lockout lever stud track)
● Left and right hand door shutter springs (sparingly *).

Note: * The door shutter springs must be lubricated to prevent corrosion. Be careful that no lubricant can be picked up by the currency.

Truck Door Guides   Truck Door Track   Door Liink Track   Lockout Lever Track

Door Link

Door Shutter Spring   (Standard Plastic Cassette)

Cleaning

Clean the cassette with a cloth dampened with water. For stubborn marks and grease try a clean cloth dampened with isopropyl alcohol. Do not use any other cleaning agents or abrasives.

Replacing Dispenser Modules

There are a number of modules that may be replaced with the dispenser in an ATM depending on the mounting arrangements

● For top mounting, the control board and pick modules

● For bottom mounting, the control board, spray module and a pick module (except the lower or only pick module)
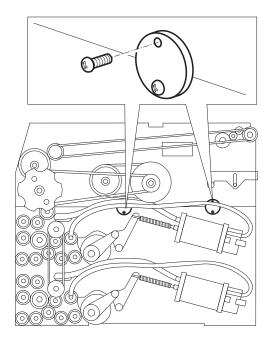
Replacing the Control Board

The control board is secured by 4 screws and is behind a metal panel which is secured by 4 screws. Access to the control board is gained by removing the metal panel.

After fitting the new control board, ensure that the configuration switches have been correctly set.

Replacing the Spray Module

The spray module is secured to the pick module by 4 screws, 2 each side.

After fitting the new spray module, ensure that the timing adjustments are correctly set.
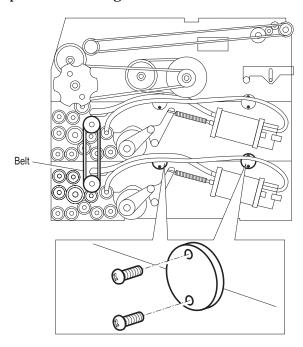
Replacing the Pick Module

The spray module needs to be removed first to gain access to the pick modules in a bottom mounted dispenser. For top mounted dispensers, the pick modules need to be removed from the bottom to gain access.

If there is only one pick module, removing the spray module will allow the pick module to be replaced.

If there are two or more pick modules, the pick modules need to be separated.

1   Remove the drive belt linking the two pick modules.

2   Remove the 8 screws (4 each side) securing the two pick modules together.

Belt

3   Reassemble the dispenser with the new pick module.

4   Replace the drive belt, ensuring that timings are set.

Replacing Cassette Components

Special Tools

Two special tools are available to help in dismantling the cassette. These simplify the disassembly and reduce the possibility of damage to components caused by the use of normal hand tools. The tools are:

- The pusher pawl wedge (Part No. 445-0598365)
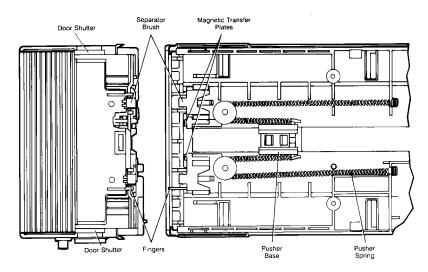- The cassette base dismantling fixture (Part No. 445-0589012).

Orders for each item should be directed in the normal manner to:

- Domestic - WSPC, Peachtree City, Georgia
- International - Service Parts Distribution Centre, Nobel Road, Dundee Scotland.

Additionally, to carry out the following dismantling procedures, you will require a pick module keyplate.

Cassette Body Components

The following illustration shows the components of the cassette body with the base removed. The only components of the body which require you to remove the base are the pusher springs.

Door Shutters
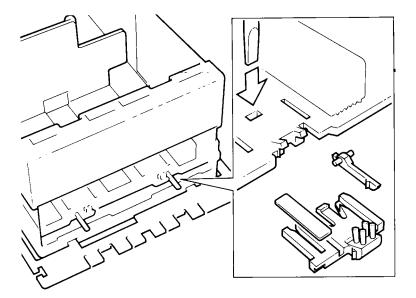
The left and right truck door shutters are removable when the truck door is open.

1   Open and remove the cassette lid.

2   Open the truck door using a pick module keyplate.

3   Unclip the flat metal springs of the door shutters and slide the shutters back out of their tracks.

Note: The shutters and their tracks are marked R.H. (right hand) and L.H. (left hand).

Brushes, Fingers and Magnetic Transfer Plates

The plastic mouldings of the right and left separator brushes retain the currency fingers and note low magnet transfer plates in position at the front of the cassette. Remove these as follows:
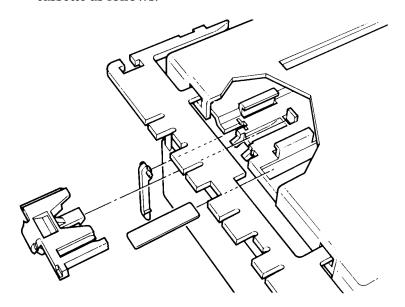

1   Open and remove the cassette lid.

2   Open the truck door using a pick module keyplate.

3   Hold the pusher back, clear of the front of the cassette.

4   Grasp the head of a separator brush between the thumb and forefinger and pull forward. At the same time push down on the brush clip, in the slot directly behind the brush bristles, with a small screwdriver blade.

5 The magnetic transfer plate and currency finger drop
out as the brush comes clear of the cassette.

Note: The currency fingers and magnetic transfer plates
can be placed at either side but the brushes are right and
left handed.

Replace the transfer plates and currency fingers in the
cassette as follows:

1 Turn the cassette upside down and support it on one
hand, using this hand to hold the pusher back.

2 With your free hand put the magnetic transfer plate
into its recess next to the pusher guide slot. Use the
fingers of your hand supporting the cassette to guide
the transfer plate into place.

3 Hang the currency finger on its location.

4   Slide the brush in until its clip engages.
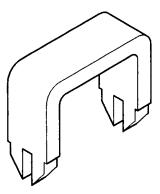
Cassette Handle and Latch

Exert pressure on one leg of the handle until the pin at that side becomes free.

The cassette latch is riveted in position and is not replaceable for security reasons.
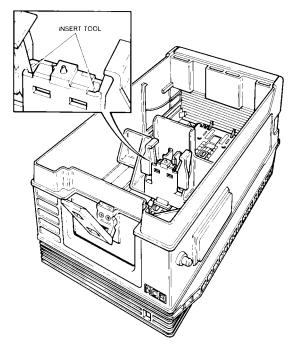
Pusher Pawl

Detach the pusher pawl from the cassette body using a pusher pawl wedge (shown in the following illustration).

1   Press the flaps of the low note magnet block together and lift the block out of the pusher.

2   Insert the pusher pawl wedge into the slots in the top
cap of the pusher.
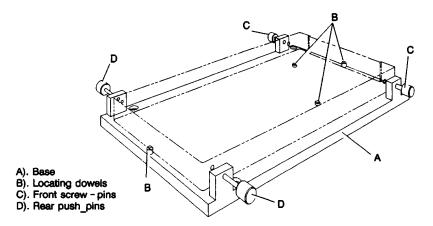
3   Press down on the wedge (to release the four clips
which secure the top cap and spring) until the top
cap springs out.

4   Remove the spring and pusher.

Separating the Cassette Base and Body

Separate the cassette base from the body in the following order:

1   Remove the cassette lid.

2   * Unscrew and remove the currency length guide clamps.

3   * Slightly lift the rear of the currency length guides and push the guides to the rear until they unclip. Remove the guides.

4   Remove the five screws in the floor of the cassette.

5   Place the cassette (top up) on the cassette base dismantling fixture so that it is held by the locating dowels and the truck door is at the screw-in pins end.

A). Base
B). Locating dowels
C). Front screw – pins
D). Rear push_pins

6   Check that the front screw-pins and rear push-pins enter the snap in features on both sides of the base near each corner under the external guide.

7   Screw in the two front pins until the body of the cassette parts from the base.

8   Push in the two rear pins while pushing the body up from the base with your thumbs.

9   Lift the cassette body from the base.
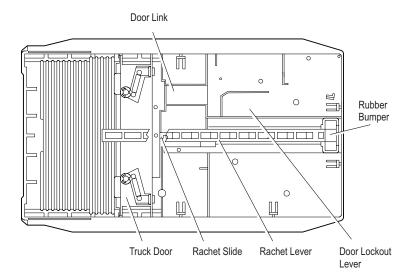
Note: * Steps 2 and 3 of this procedure need only be done if the currency guides are covering any of the screws in the floor of the cassette.

Pusher Springs

With the base separated from the body the pusher springs can be unhooked and removed.

Cassette Base Components

The illustration shows the components inside the base of the tamper indicating cassette.

Door Link

Rubber Bumper

Truck Door   Rachet Slide   Rachet Lever   Door Lockout Lever

Truck Door Assembly

Unhook the truck door assembly from the ratchet slide and lift it out of the base.

Pusher Ratchet

Remove the pusher ratchet mechanism as follows:

1   Lift out the rubber bumper at the rear of the base.

2   Push the lower slide to the rear while holding the top ratchet until the slide projects about 4 mm (0.16in) from the rear of the ratchet.

3   Lift the ratchet from the front and remove.

4   Pull the slide out of the base towards the front.

Appendix A

Specifications

Dispenser Specifications

Currency

The dispenser is capable of dispensing new or used currency of the follwing dimensions:

	Minimum	Maximum
Width	65mm (2.56in)	95mm (3.74in)
Length	120mm (4.72in)	172mm (6.77in)
Thickness	0.06mm (0.002in)	0.26mm (0.01in)

Tolerance on bill dimensions is ± 2mm. (0.078in)

Cassette capacity up to 295mm of new or used (11.61in) bills.

Reject Bin

Capacity of 50 bills.

EMC

FCC CFR47 part 15 and EN 55022 Class A radiated and conducted limits within the following margins:

- Radiated emission margin 4dBμV/m
- Conducted emission margin 20dBμV (QP)

ESD

IEC 1000-4-2 with the following test levels:

- Air discharge ± 8kV
- Contact discharge ± 4kV

Power Requirements

AC Power

- 115VAC (± 10%) 5.5A RMS 20A surge
- 230VAC (± 10%) 3A RMS 10A surge

DC Power

- +5V $\pm$ 5% 1.5A
- +24V $\pm$ 5% 2A

Accoustic Noise

Maximum noise emission level: 84dBA

Weight

The weights of the component parts of the dispenser are:

Basic unit (empty media containers	17.5kg
Currency cassette (empty)	3.2kg
Currency cassette (full)	6kg
Reject bin (empty)	0.37kg
Reject bin (full)	0.41kg

Dimensions

The dimensions of the dispenser are:

Width without mounting feet with mounting feet	300mm 330mm
Height 1 cassette 2 cassette 3 cassette 4 cassette	310mm 445mm 580mm 715mm
Depth	475mm

Environment

The environment is specified as existing within the host ATM.

● Normal operating range

Temperature	
Dry bulb	10°C to 50°C
Change	10°C per hour (maximum)
Dew point	26°C (maximum)

Humidity	
Relative	20% to 80%
Change	10% per hour maximum (no condensation)

Reliability Data

Reliability is expressed in terms of

● Inconvenience Failures

● Critical Failures

Inconvenience Failures

An inconvenience failure is a failure which is inconvenient to the cardholder or ATM operator/owner but does not prohibit use of the dispenser on a practical basis.

Reject Rate   This is considered to be an inconvenience failure if the rate exceeds 1.5% of items dispensed.

Reject rate is specified as the number of rejected items divided by the total number of items dispensed while operating at average workload (see section 8.0)

Inconvenience Failure Rate   This is specified as the number of inconvenience failures divided by the number of items dispensed stated as a decimal number.

Types of Inconvenience Failure

- Transaction correct but delayed in reaching the customer due to a malfunction such as a pick fail. It is assumed that recovery has been achieved by adopting the highest level of error recovery provided by the module and operating system.
  - Failure Rate $= 11.5 \times 10^{-6}$
- Transaction incorrect due to a malfunction but has been detected and reported.
  - Failure Rate $= 3.0 \times 10^{-6}$
- Transaction incorrect due to a malfunction but has not been detected in the module.
  - Failure Rate $= 0.5 \times 10-6$

Critical Failures

A critical failure is a failure or combination of failures which renders the module unusable until that failure has been repaired or recovered through intervention.

Critical failure rate is the maximum number of design, manufacture and user dependent critical failures that are allowable for a specified amount of items dispensed.

A Critical Failure is defined as the number of failures divided by the total number of items dispensed expressed as a decimal number. The reciprocal of this number is the mean number of items dispensed between failures.

The example shown below is for a 4 high dispenser at 24 hours per day and workload of 280 transactions a day with 2.5 items dispensed per transaction.

Transaction Related		Time Related	
Failure Rate	Mean Items Dispensed Between Failure	Failure Rate per Annum	Mean Time Between Failures (Hours)
$3.34 \times 10\text{-}6$	299.4 K	0.05	175k

Total Failure Rate per Annum	=	Transaction Related+ Time Related
	=	$0.853 + 0.05$
	=	0.903

- Reliability of other combinations can be calculated by addition of module failure rates as required.
- Customer clearable failure rate will be 75% of total
- Service call failure rate will be 25% of total

Appendix B

Replaceable Parts

On-Site Replacements

NCR recommends an on site replacement philosophy at a module level based on the expected failure rates. For the 5633 dispenser, the following parts are recommended to be replaced on site and then returned to a repair centre for rework:

NCR Part Number	Description
445-0639532	Spray Module 120V F/A
445-0639533	Spray Module 230V F/A
445-0639534	Spray Module 120V R/A
445-0639535	Spray Module 230V R/A
445-0639237	Dispenser Control Board
445-0638138	Single Pick Unit
277-0009574	Vacuum Cup

NCR   User Feedback Form

Title: NCR 5633 Currency Dispenser
Service Manual

Number: B006-0000-6086   **Release:** 01.00.00   **Date:** Jan 1999

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Completeness	5 4 3 2 1 0	2 = Fair
Organization	5 4 3 2 1 0	1 = Poor
Appearance	5 4 3 2 1 0	0 = Not Applicable
Examples	5 4 3 2 1 0	
Illustrations	5 4 3 2 1 0	
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Question resolution	5 4 3 2 1 0	
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- ❏ Improve the table of contents
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- ❏ Improve the organization
- ❏ Improve the index
- ❏ Make it less technical
- ❏ Make it more concise/brief

- ❏ Add more/better quick reference aids
- ❏ Add more examples
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- ❏ Add more step-by-step procedures
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- ❏ Add more detail

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